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WATER SUPPLY OUTLOOK FOR MONTANA.



U. S. DEPARTMENT of AGRICULTURE ★ SOIL CONSERVATION SERVICE

Collaborating with

MONTANA AGRICULTURAL EXPERIMENT STATION

**SNOW PILLOW RECORDS
1977 WATER YEAR**

Data included in this report were obtained by the agencies named above in cooperation with Federal, State and private organizations listed inside the back cover of this report.

TO RECIPIENTS OF WATER SUPPLY OUTLOOK REPORTS:

Most of the usable water in western states originates as mountain snowfall. This snowfall accumulates during the winter and spring, several months before the snow melts and appears as streamflow. Since the runoff from precipitation as snow is delayed, estimates of snowmelt runoff can be made well in advance of its occurrence. Streamflow forecasts published in this report are based principally on measurement of the water equivalent of the mountain snowpack.

Forecasts become more accurate as more of the data affecting runoff are measured. All forecasts assume that climatic factors during the remainder of the snow accumulation and melt season will interact with a resultant average effect on runoff. Early season forecasts are therefore subject to a greater change than those made on later dates.

The snow course measurement is obtained by sampling snow depth and water equivalent at surveyed and marked locations in mountain areas. A total of about ten samples are taken at each location. The average of these are reported as snow depth and water equivalent. These measurements are repeated in the same location near the same dates each year.

Snow surveys are made monthly or semi-monthly from January 1 through June 1 in most states. There are about 1900 snow courses in Western United States and in the Columbia Basin in British Columbia. Networks of automatic snow water equivalent and related data sensing devices, along with radio telemetry are expanding and will provide a continuous record of snow water and other parameters at key locations.

Detailed data on snow course and soil moisture measurements are presented in state and local reports. Other data on reservoir storage, summaries of precipitation, current streamflow, and soil moisture conditions at valley elevations are also included. The report for Western United States presents a broad picture of water supply outlook conditions, including selected streamflow forecasts, summary of snow accumulation to date, and storage in larger reservoirs.

Snow survey and soil moisture data for the period of record are published by the Soil Conservation Service by states about every five years. Data for the current year is summarized in a West-wide basic data summary and published about October 1 of each year.

COVER PHOTO: SNOW COURSE MEASUREMENTS BY A SURVEY TEAM IN UTAH'S WASATCH RANGE.
ORC-254-10

PUBLISHED BY SOIL CONSERVATION SERVICE

The Soil Conservation Service publishes reports following the principal snow survey dates from January 1 through June 1 in cooperation with state water administrators, agricultural experiment stations and others. Copies of the reports for Western United States and all state reports may be obtained from Soil Conservation Service, West Technical Service Center, Room 510, 511 N.W. Broadway, Portland, Oregon 97209.

Copies of state and local reports may also be obtained from state offices of the Soil Conservation Service in the following states:

STATE	ADDRESS
Alaska	Room 129, 2221 East Northern Lights Blvd., Anchorage, Alaska 99504
Arizona	Room 3008, 6029 Federal Building, Phoenix, Arizona 85025
Colorado (N. Mex.)	P. O. Box 17107, Denver, Colorado 80217
Idaho	Room 345, 304 N. 8th. St., Boise, Idaho 83702
Montana	P. O. Box 98, Bozeman, Montana 59715
Nevada	P. O. Box 4850, Reno Nevada 89505
Oregon	1220 S.W. Third Ave., Portland, Oregon 97204
Utah	4012 Federal Bldg., 125 South State St., Salt Lake City, Utah 84138
Washington	360 U.S. Court House, Spokane, Washington 99201
Wyoming	P. O. Box 2440, Casper, Wyoming 82602

PUBLISHED BY OTHER AGENCIES

Water Supply Outlook reports prepared by other agencies include a report for California by the Water Supply Forecast and Snow Surveys Unit, California Department of Water Resources, P. O. Box 388, Sacramento, California 95802 --- and for British Columbia by the Department of Lands, Forests and Water Resources, Water Resources Service, Parliament Building, Victoria, British Columbia



WATER SUPPLY OUTLOOK FOR MONTANA

and
FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS

Issued by

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MONTANA FALL SUMMARY
October 1, 1977

* * * * *
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* 1977 spring and summer runoff was near minimum of *
* record for most Montana streams. The snowmelt *
* runoff was very low. Some areas received good *
* spring and summer rains which helped hold late *
* season streamflow above minimum levels. Some *
* streams in Central Montana had near average runoff. *
* Irrigation water was in short supply in many areas. *
* Preliminary reports indicate crop yields were re- *
* duced in many areas by lack of irrigation water. *
* Some areas also fared quite well as a result of *
* well timed rains. Many reservoirs did not fill *
* this spring and are currently at very low levels *
* or are empty. *
*
* * * * *

COLUMBIA RIVER DRAINAGE

April through September runoff was in the 30 to 40 percent average range for the Clark Fork River drainage. Some smaller lower elevation drainages had only 20 to 30 percent of their normal runoff. The Kootenai and Flathead Rivers had 55 to 65 percent average streamflow.

Many irrigation reservoirs did not fill and current storage is very low. Irrigation supplies were short in most areas with some reduction in crop production reported.

Recent rains and snow in the higher elevations have helped increase soil moisture levels, but they have not been enough to produce much runoff.

Streamflow is expected to remain below average through the winter months.

MISSOURI RIVER DRAINAGE

The April through September runoff was about one-half average from the Missouri River headwaters. The lowest runoff, about 30 percent of average, came from the Beaverhead. The Big Hole and Jefferson Rivers had about 40 percent of average, the Gallatin about 50 percent and the Madison River about 60-65 percent of average. Runoff into Gibson Reservoir was about one-third of average while Sheep Creek near White Sulphur Springs produced runoff that was 85 percent of average.

Some areas, particularly the extreme southwest corner of the State had spring rainfall well above average. Many other southwest areas received good rainfall at critical periods through the growing season. This same area picked up good runoff and reservoir storage from late season snowfall and fairly heavy rains in May and June.

Other areas were not as fortunate and experienced water shortages to varying degrees. Preliminary reports indicate some crop reduction from droughty conditions in these areas. Recent rainfall and snow in the higher elevations has recharged soil moisture in many drainages.

YELLOWSTONE RIVER DRAINAGE

Runoff for the April through September period was about one-half average. Some of the smaller tributaries and the Big Horn River produced 35 to 45 percent average streamflow. Flow in the rivers was particularly low during the summer period of heavy irrigation demand. Irrigation water supplies were critical on many of the smaller tributaries.

Soil moisture in the mountain watersheds is fair with recent rains and snow in the higher elevations helping replace soil moisture reservoirs.

SOIL MOISTURE - July 1, 1977

DRAINAGE BASIN and/or STATION		Profile (Inches)		Date of Survey	Soil Moisture (Inches)		
Name	Elevation	Depth	Capacity		This Year	Last Year	Average †

COLUMBIA RIVER BASIN

<u>Kootenai</u>							
Baree Trail	3800	48	7.5	7-7	3.8	5.9	5.5
Murphy Lake R. S.	3000	48	22.6	7-1	18.7	19.4	19.9
Raven	3050	48	23.0	7-5	13.6	16.7	17.2

<u>Flathead</u>							
Desert Mountain	5600	54	8.4	6-29	5.9	8.3	8.5
Marias Pass	5250	54	6.5	6-21	6.6	6.9	5.5

<u>Clark Fork</u>							
Black Pine	7100	48	10.0	6-29	8.7	8.6	8.8
Lubrecht Forest	4100	48	26.8	-	-	-	-
Seeley Lake R. S.	4030	48	11.9	7-8	4.7	-	-
Skalkaho Summit	7260	48	10.8	6-29	10.6	9.8	10.1

<u>Bitterroot</u>							
Gibbons Pass	7100	48	7.1	-	-	5.2	6.3
Lolo Pass	5250	48	10.6	6-30	6.2	9.1	9.5

MISSOURI RIVER BASIN

<u>Beaverhead</u>							
Lakeview	6700	48	15.3	6-30	16.3	14.4	13.7

<u>Madison</u>							
West Yellowstone	6700	48	6.5	7-3	2.6	2.6	2.9

<u>Gallatin</u>							
Bridger Bowl	7250	48	17.0	6-28	15.6	14.9	15.8
College Site No. 2	4860	48	17.7	7-1	11.3	14.2	13.3
Lick Creek	6860	48	18.8	6-27	14.0	14.4	16.9
Twenty-One Mile	7150	48	10.0	7-3	8.0	8.2	8.7

<u>Missouri Main Stem</u>							
Kings Hill	7420	48	11.8	6-30	9.8	10.2	10.7
Stemple Pass	6350	48	5.9	6-30	4.0	5.0	5.0

<u>Milk</u>							
Beaver Creek	3950	48	20.9	6-30	11.0	10.3	12.6
Rocky Boy	4700	36	10.1	6-30	7.1	9.7	9.2

<u>Yellowstone</u>							
Battle Ridge	6020	48	17.6	6-28	12.4	13.1	14.4
Northeast Entrance	7350	48	9.4	-	-	8.7	8.8
PMC Dryland	3700	48	20.7	-	-	5.7	-

† Average for period of record.

SOIL MOISTURE - August 1, 1977

DRAINAGE BASIN and/or STATION		Profile (Inches)		Date of Survey	Soil Moisture (Inches)		
Name	Elevation	Depth	Capacity		This Year	Last Year	Average †

COLUMBIA RIVER BASIN

Kootenai

Baree Trail	3800	48	7.5	8-1	3.4	3.5	3.6
Murphy Lake R. S.	3000	48	22.6	8-1	18.5	-	18.9
Raven	3050	48	23.0	8-1	14.0	14.7	15.7

Flathead

Desert Mountain	5600	54	8.4	7-28	6.2	7.3	6.5
Marias Pass	5250	54	6.5	7-18	4.6	5.3	4.2

Clark Fork

Black Pine	7100	48	10.0	7-28	8.7	8.5	8.5
Lubrecht Forest	4100	48	26.8	-	-	-	-
Seeley Lake R. S.	4030	48	11.9	8-1	4.1	9.0	7.3
Skalkaho Summit	7260	48	10.8	7-28	10.7	10.2	10.4

Bitterroot

Gibbons Pass	7100	48	7.1	-	-	5.7	5.0
Lolo Pass	5250	48	10.6	7-28	4.2	7.3	5.9

MISSOURI RIVER BASIN

Beaverhead

Lakeview	6700	48	15.3	7-31	17.0	9.6	10.7
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Madison

West Yellowstone	6700	48	6.5	8-4	1.6	1.8	2.1
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Gallatin

Bridger Bowl	7250	48	17.0	8-1	15.2	14.7	15.3
College Site No. 2	4860	48	17.7	7-29	8.8	10.4	10.2
Lick Creek	6860	48	18.8	8-3	12.9	13.8	14.7
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† Average for period of record.

SOIL MOISTURE - September 1, 1977

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Name	Elevation	Depth	Capacity		This Year	Last Year	Average †

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MISSOURI RIVER BASIN

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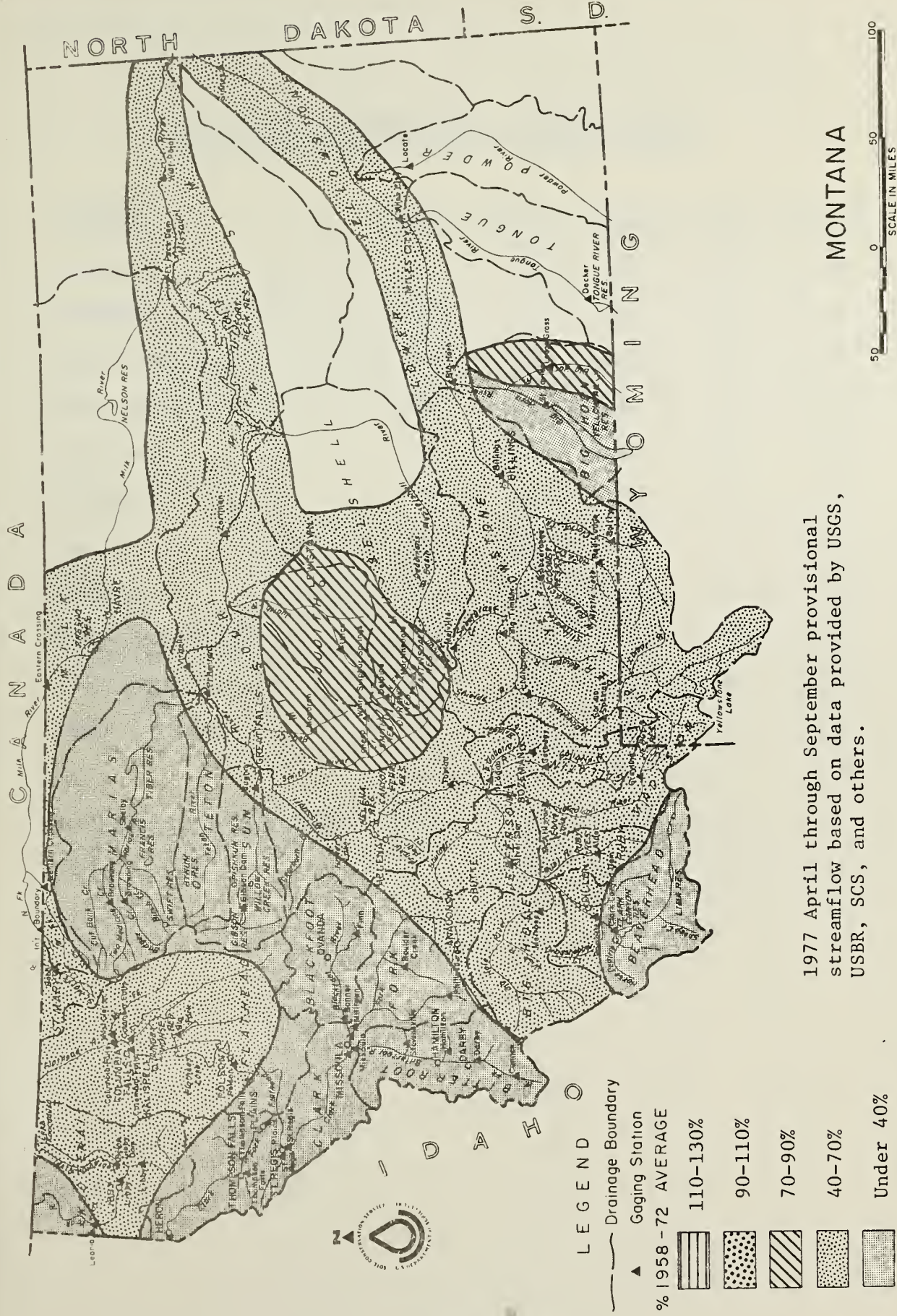
Milk

Beaver Creek	3950	48	20.9	9-29	8.0	6.5	7.1
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Yellowstone

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† Average for period of record.



1977 April through September provisional streamflow based on data provided by USGS, USBR, SCS, and others.

MONTANA

1977 SNOW COVER COMPARISONS - PERCENT AVERAGE

<u>DRAINAGE</u>	<u>Jan. 1</u>	<u>Feb. 1</u>	<u>Mar. 1</u>	<u>Apr. 1</u>	<u>May 1</u>
Kootenai	-	41	37	53	36
Flathead	47	35	43	65	41
Upper Clark Fork	44	47	40	59	23
Lower Clark Fork	31	31	34	51	31
Bitterroot	44	36	40	54	31
Jefferson	34	32	33	51	25
Madison	29	32	36	51	23
Gallatin	45	50	52	75	47
Missouri Main Stem	61	57	52	76	44
Judith-Musselshell	81	69	78	99	70
Marias-Teton-Sun	45	26	40	56	14
Milk	50	52	57	72	4
Yellowstone (at Big Horn)	48	51	54	69	47
Little Big Horn	-	114	107	122	120
St. Mary's	36	26	25	48	33

RESERVOIR STORAGE (Thousand Acre Feet) END OF MONTH

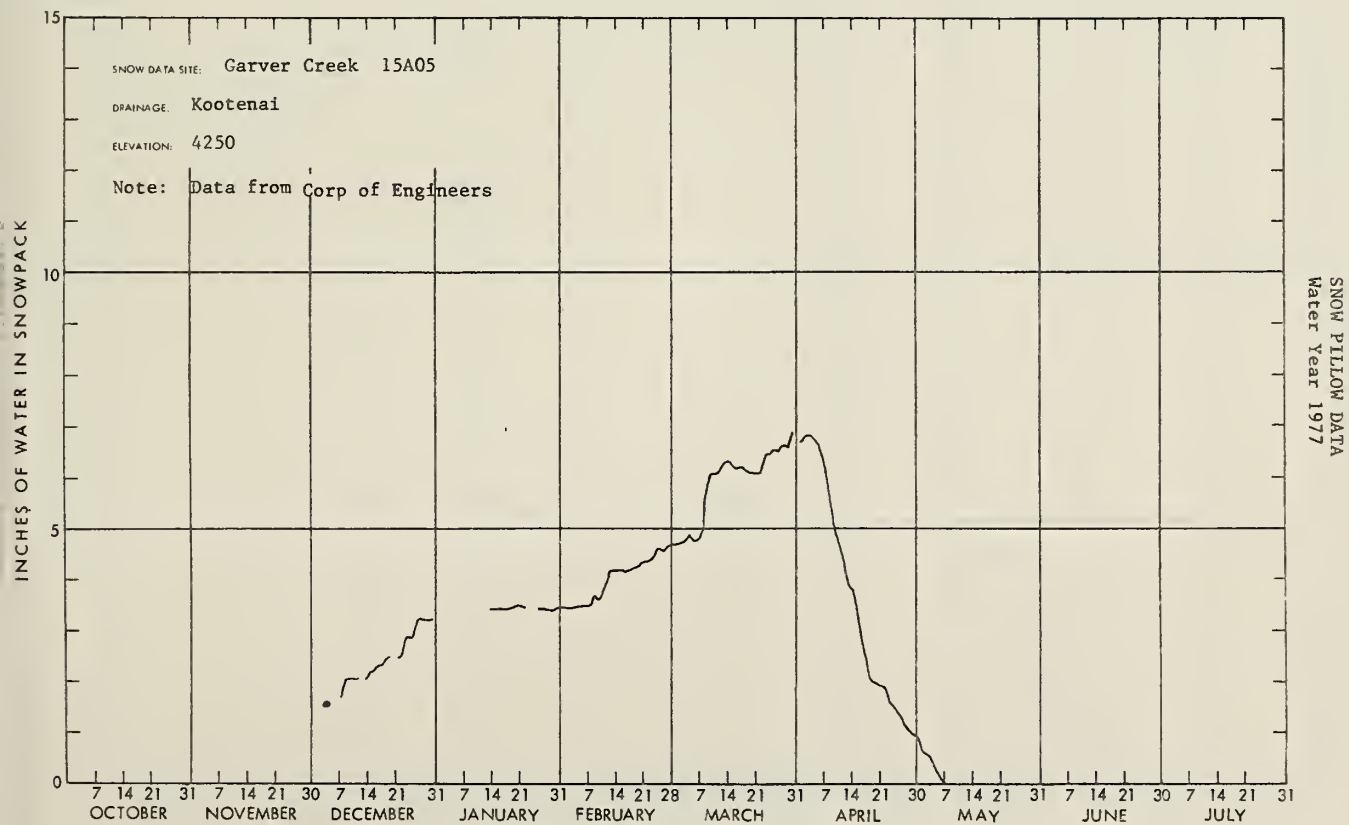
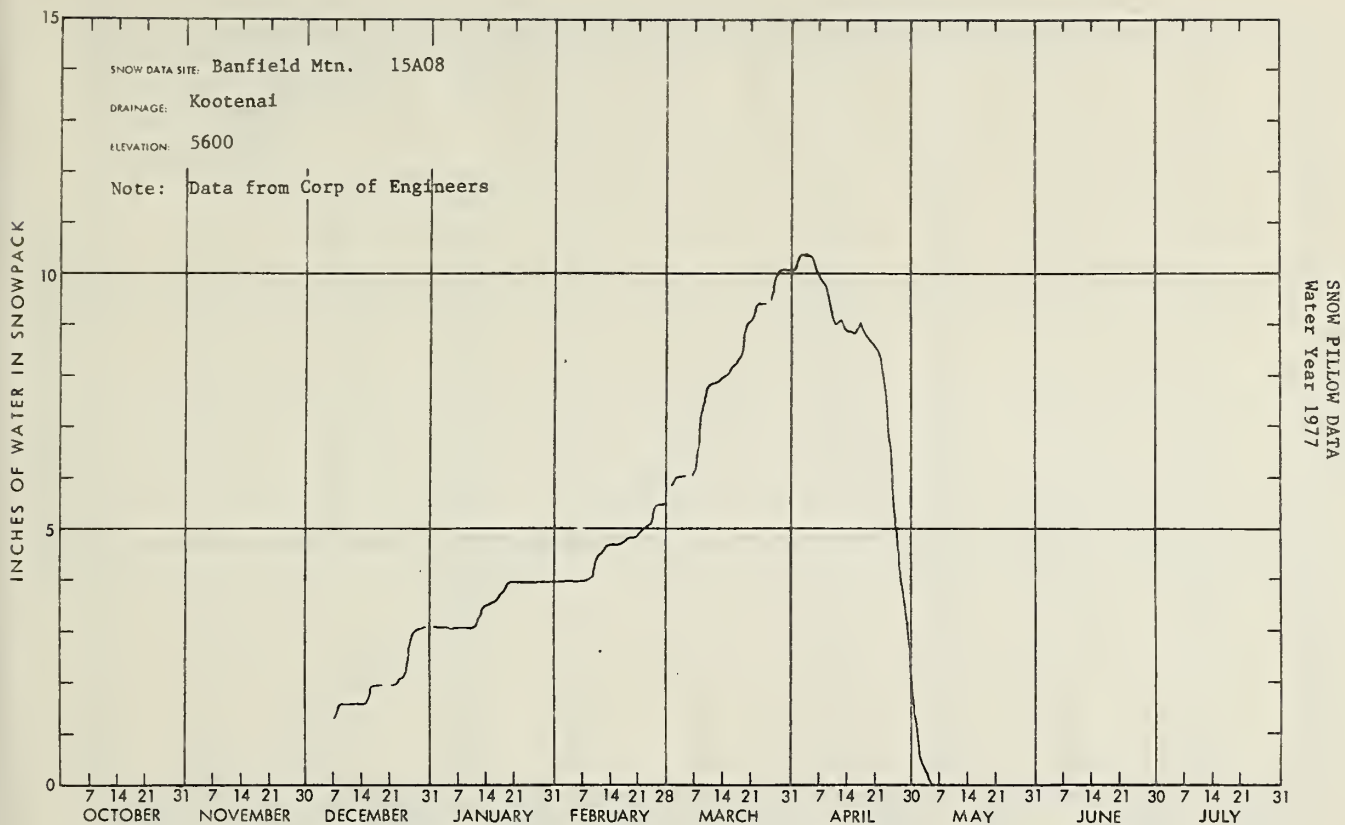
Basin or Stream	RESERVOIR	Usable Capacity	Usable Storage		
			This Year	Last Year	Average

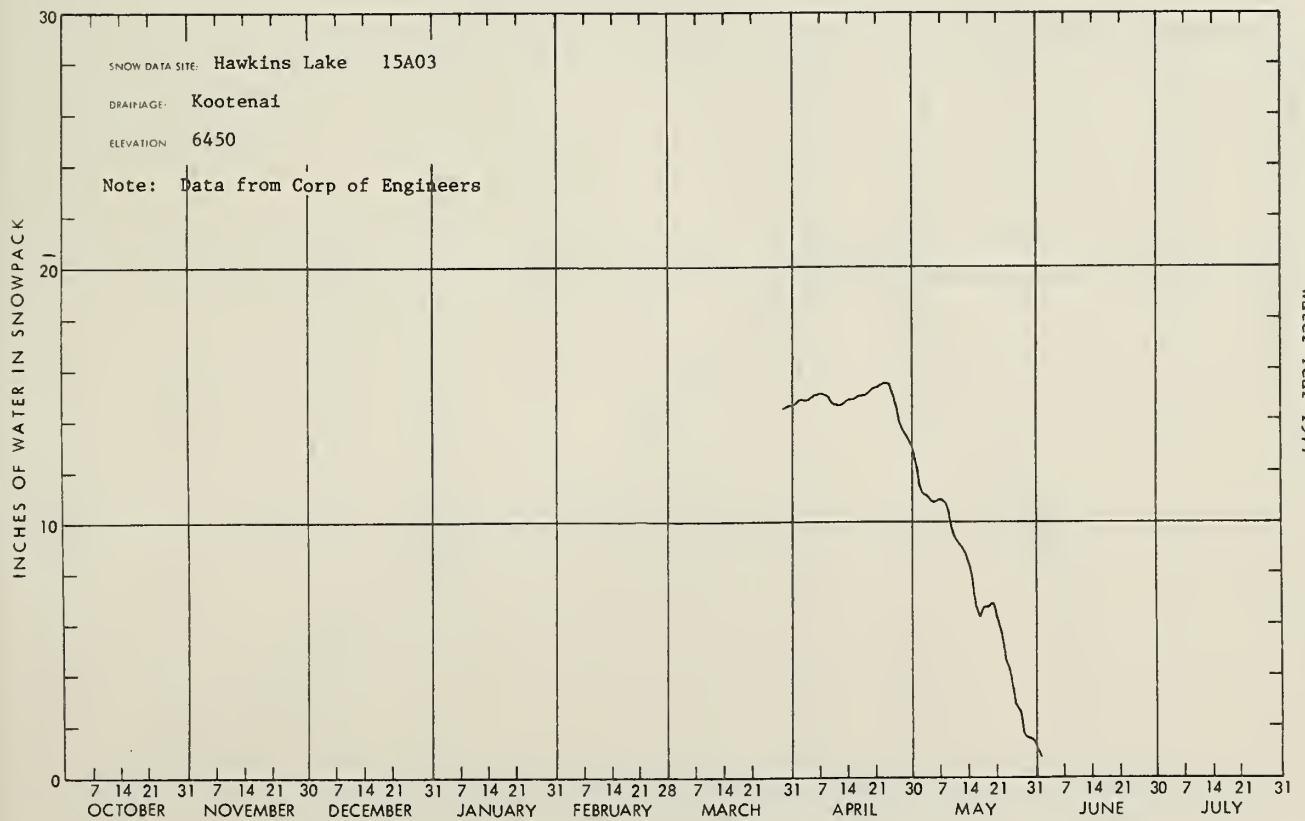
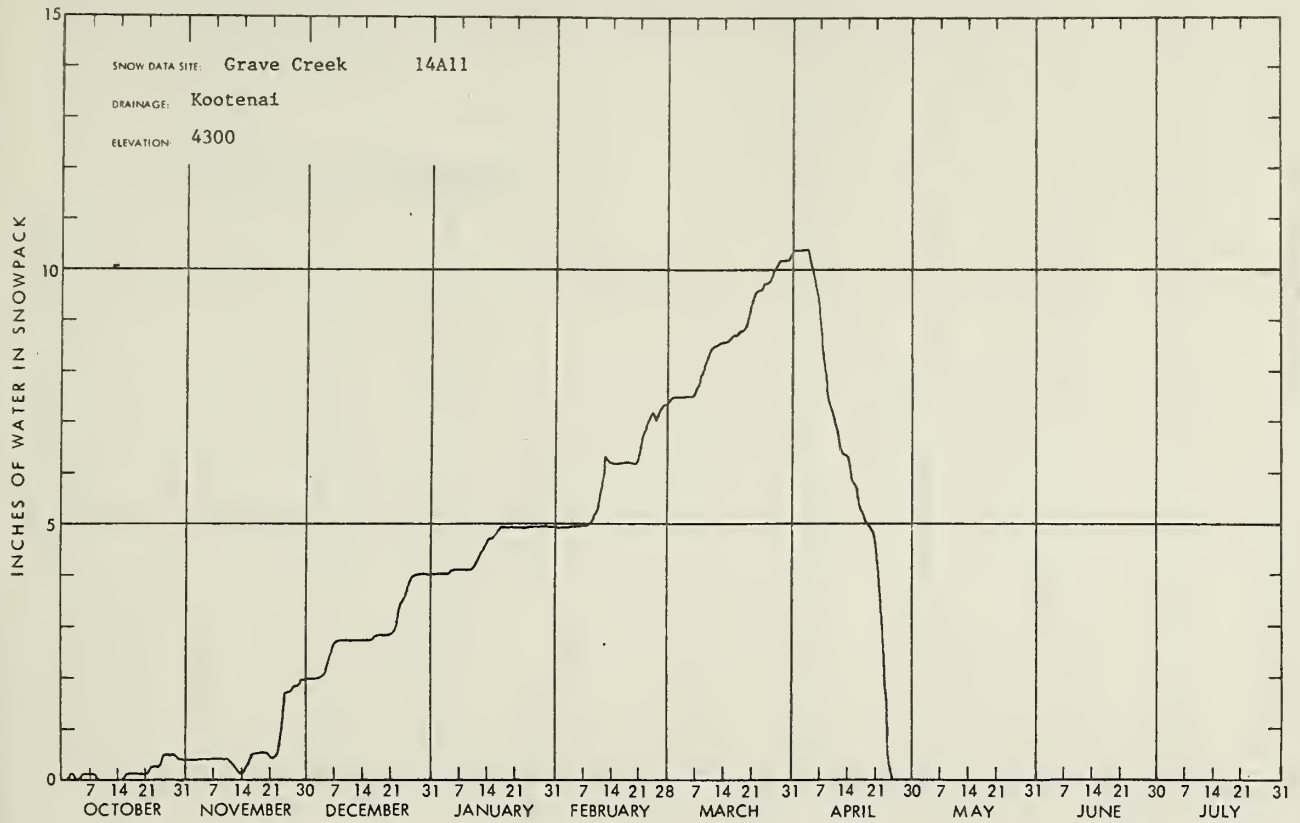
COLUMBIA RIVER BASIN

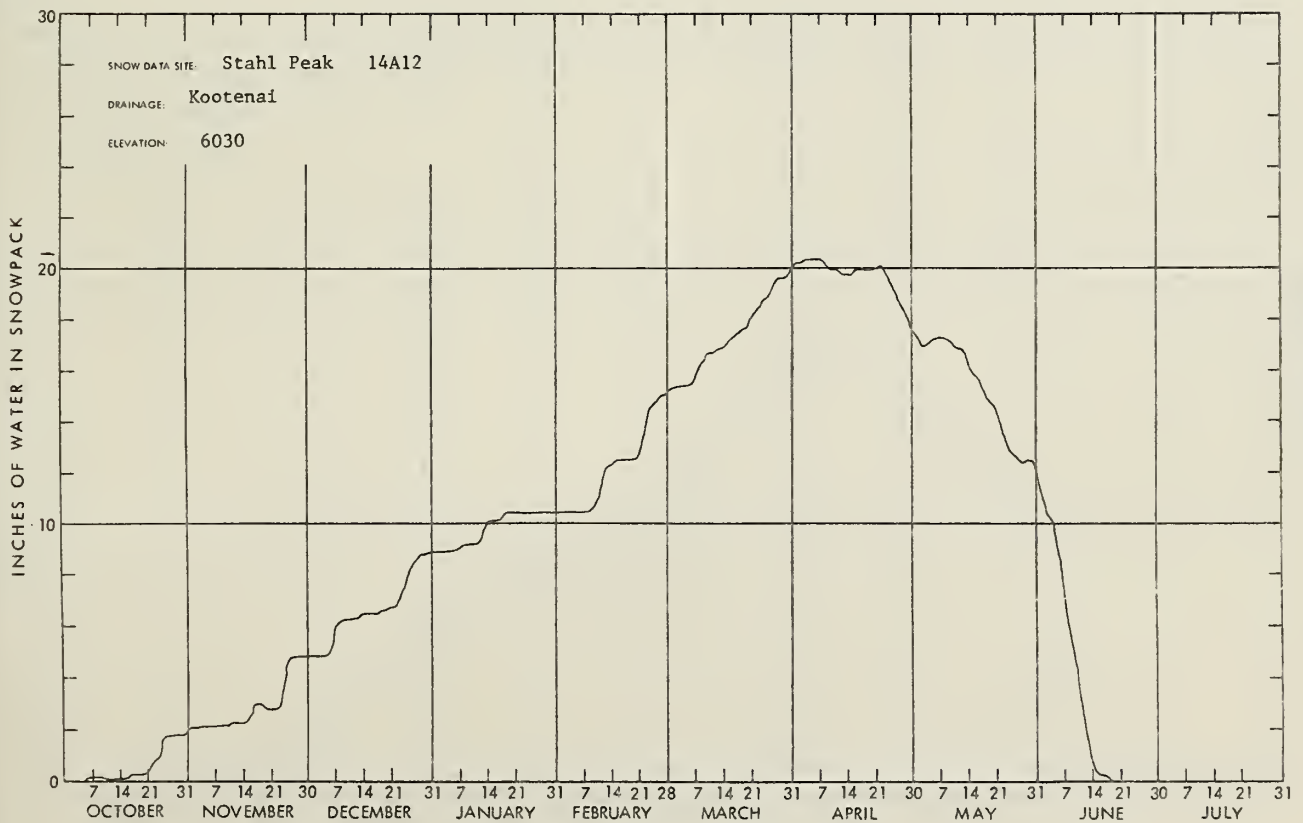
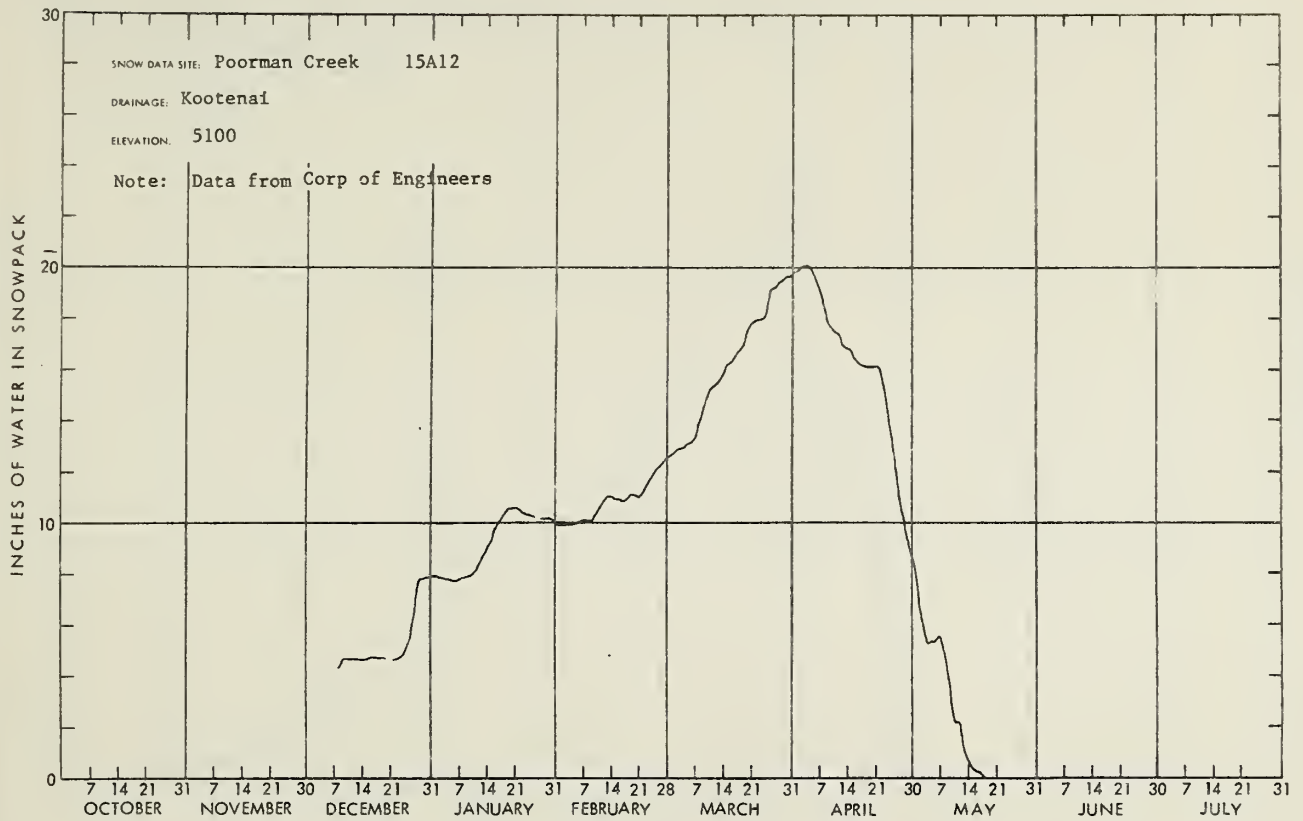
Kootenai	Koocanusa	5,694.0	3,733.0	5,604.0	--
Flathead	Hungry Horse	3,428.0	2,366.0	3,450.0	3,293.0
	Flathead Lake	1,791.0	1,728.0	1,656.0	1,738.0
	Camas (4)	45.2	3.2	15.1	21.4
	Mission Valley (8)	100.3	26.9	40.3	22.7
Clark Fork	Georgetown Lake	31.0	27.7	30.9	28.4
	Lower Willow Creek	4.9	0.0	1.6	1.2
	Nevada Creek	12.6	--	--	4.8
	Noxon Rapids	334.6	315.0	161.0	323.7
Bitterroot	Como	34.9	--	--	1.7
	Painted Rocks	31.7	18.6	9.6	26.5

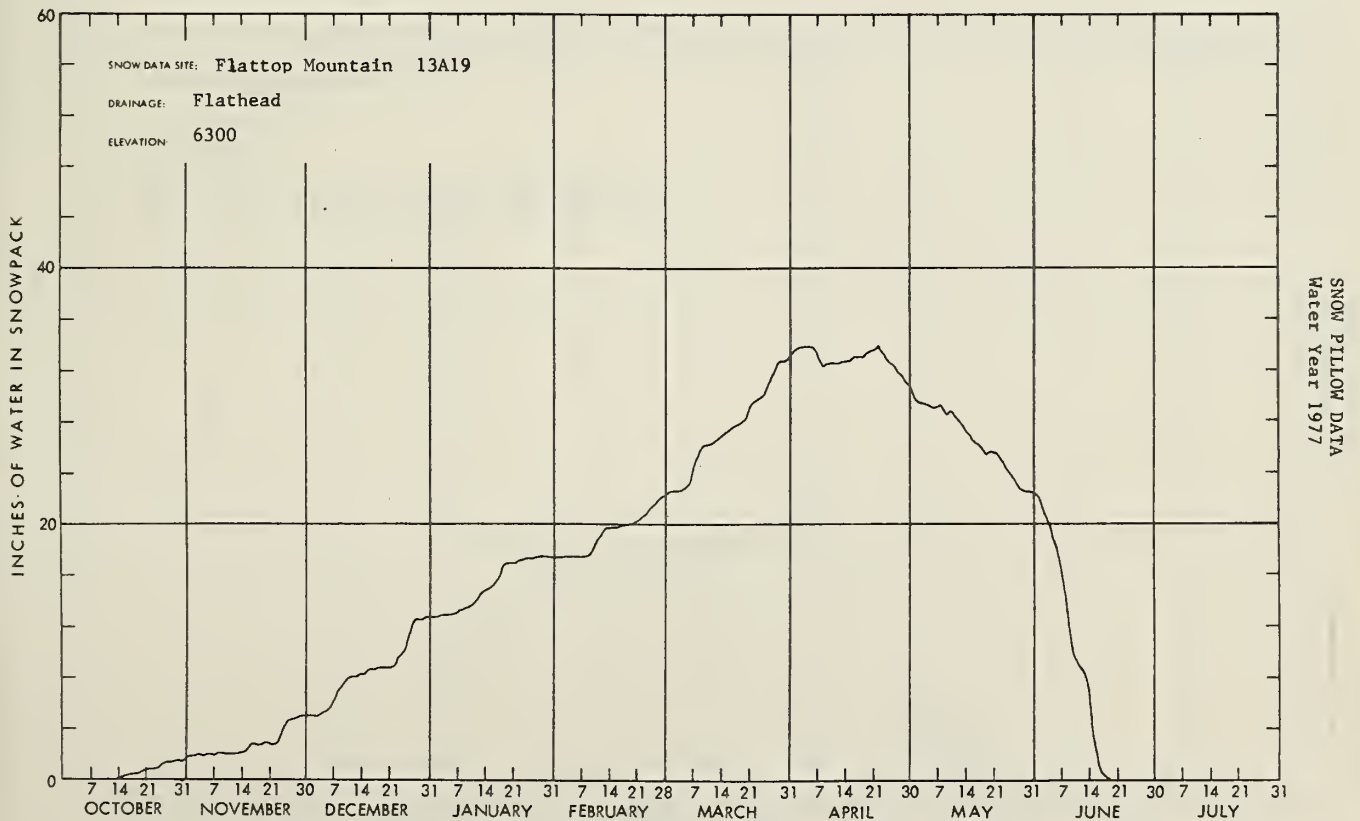
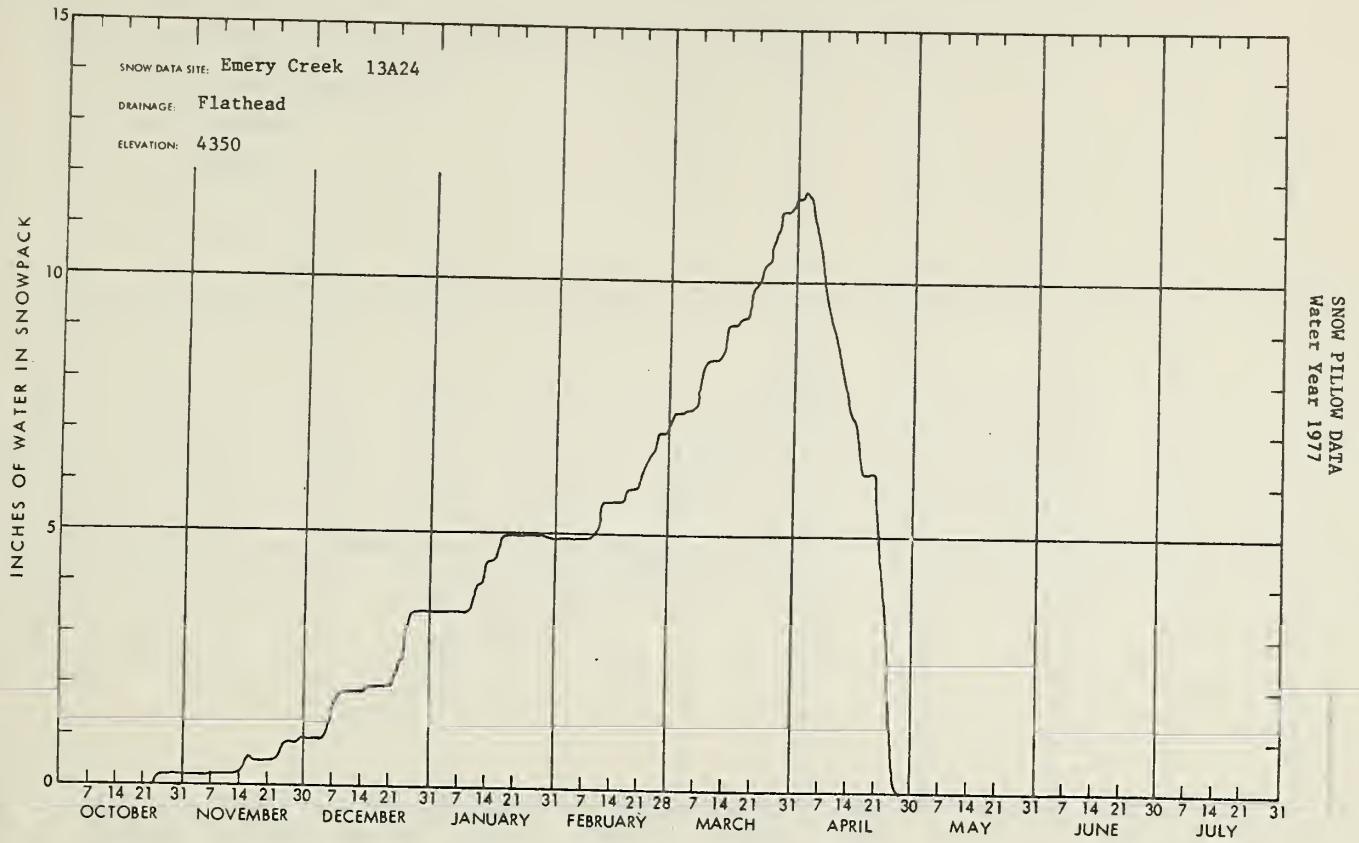
MISSOURI RIVER BASIN

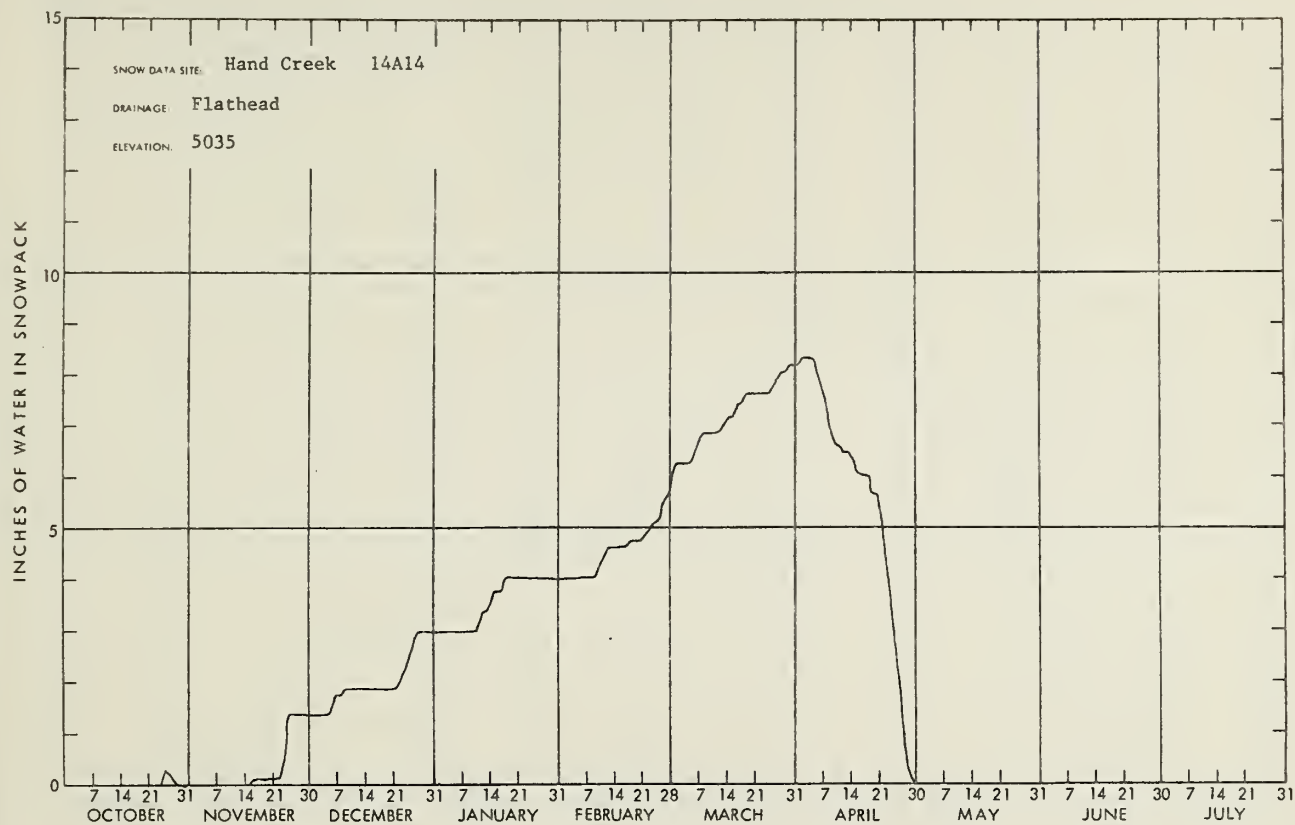
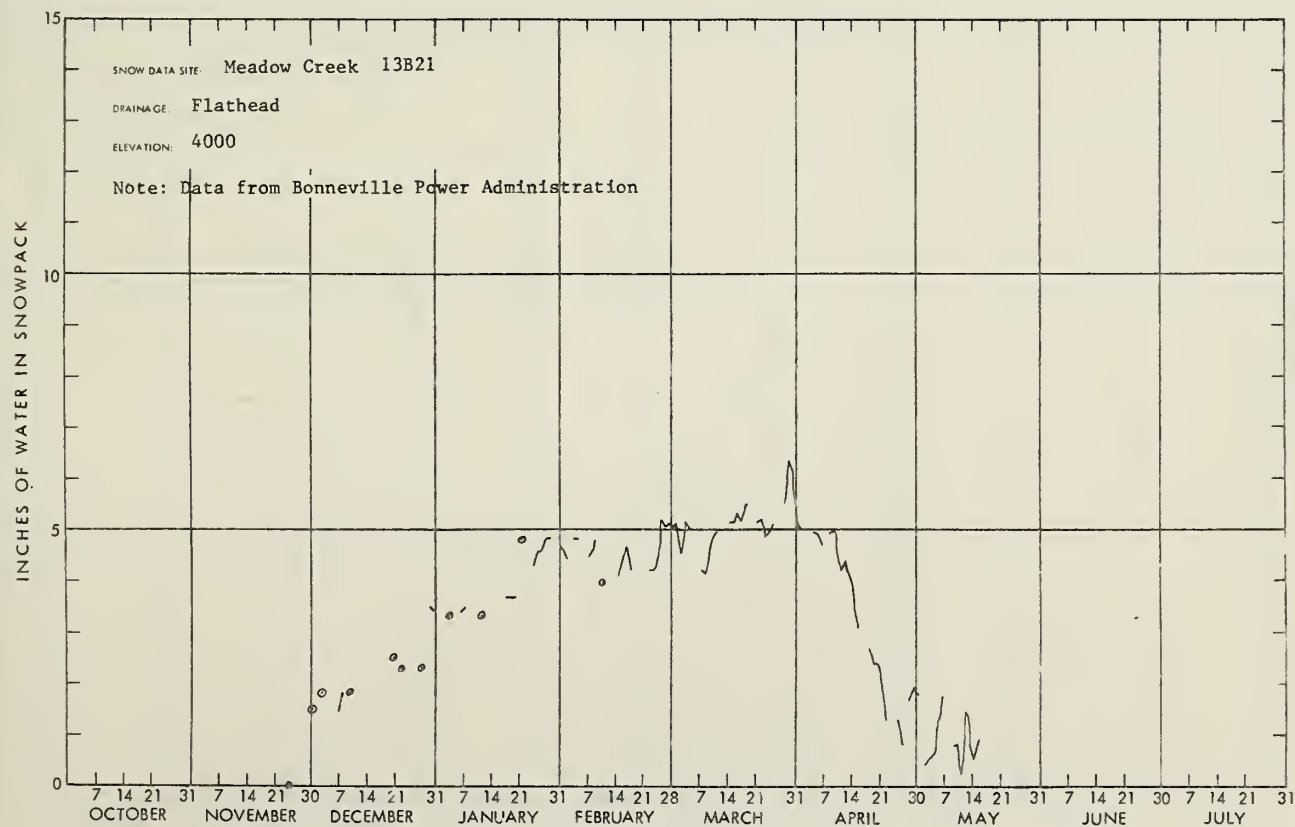
Beaverhead	Clark Canyon	257.2	115.0	158.0	125.6
	Lima	84.0	33.2	37.2	27.1
Ruby	Ruby	38.8	--	12.0	10.8
Madison	Hebgen Lake	337.5	333.0	371.1	315.9
	Ennis Lake	41.0	38.8	38.2	36.4
Gallatin	Middle Creek	8.0	2.9	3.5	2.9
Missouri	Canyon Ferry	2,043.0	1,786.0	1,803.0	1,742.0
	Hauser & Helena	61.9	60.7	62.5	58.7
	Lake Helena	10.4	10.0	10.7	10.3
	Holter Lake	81.9	80.5	77.0	75.4
	Smith River	10.6	6.6	6.8	4.8
	Bair	7.0	3.1	3.5	3.0
	Martinsdale	23.1	10.4	15.5	7.8
	Deadman's Basin	72.2	15.1	40.6	32.5
	Fort Peck Lake	18,910.0	14,980.0	17,630.0	14,550.0
Sun	Gibson	99.0	2.2	43.5	31.0
	Willow Creek	32.2	11.9	26.5	17.7
	Pishkun	32.0	16.8	17.5	16.4
Marias	Lower Two Medicine	11.9	--	--	--
	Four Horns	19.2	--	--	--
	Swift	30.0	1.4	13.3	13.9
	Lake Frances	111.9	29.8	84.3	78.9
	Tiber	1,347.0	533.0	615.7	642.3
Milk	Beaver Creek	3.5	1.5	1.7	--
	Fresno	127.2	23.4	67.2	66.2
	Nelson	66.8	6.5	51.0	43.4
	Lake Sherburne	66.2	12.5	9.6	6.5
Yellowstone	Mystic Lake	21.0	17.9	19.4	20.1
	Tongue River	68.0	20.1	--	24.1
	Cooney	27.4	3.5	12.0	12.2
Bighorn	Bighorn Lake	1,356.0	931.0	1,038.0	977.9

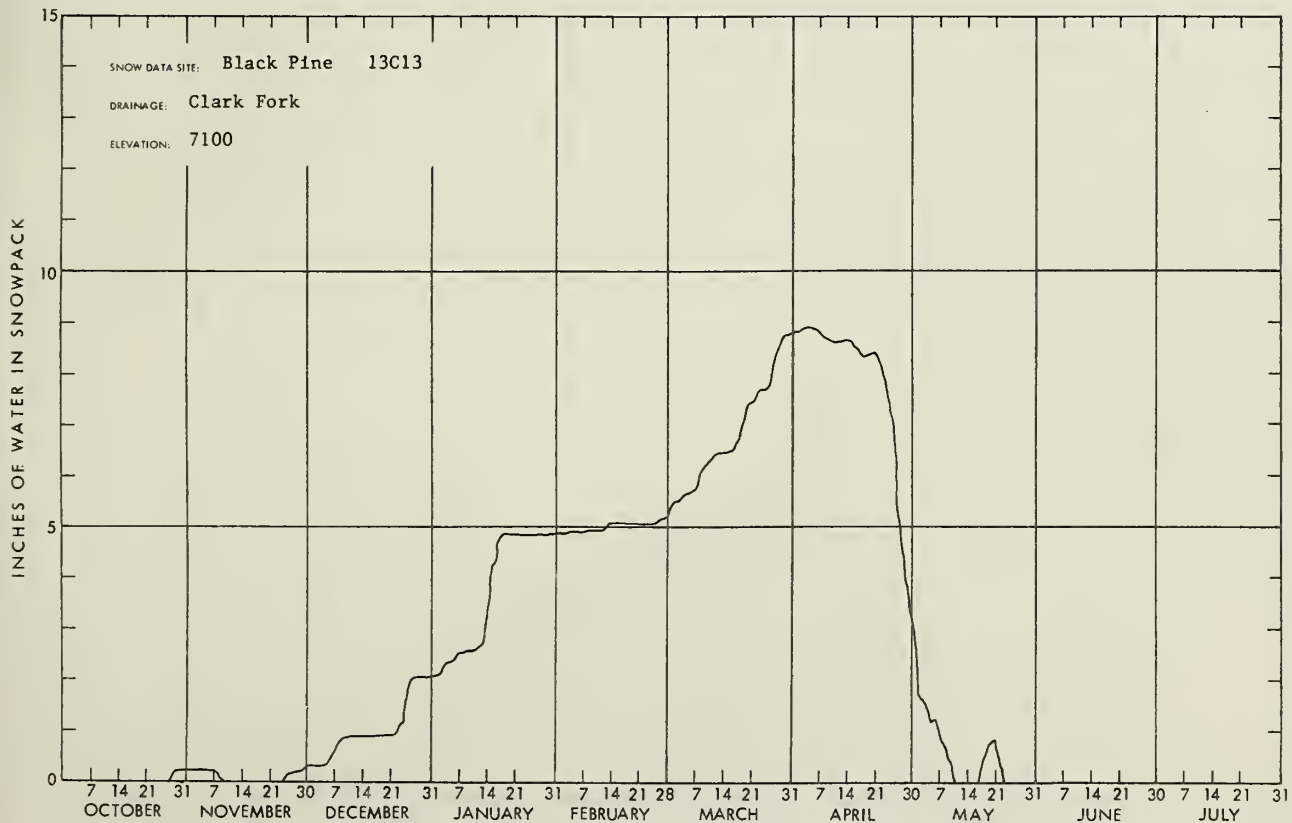
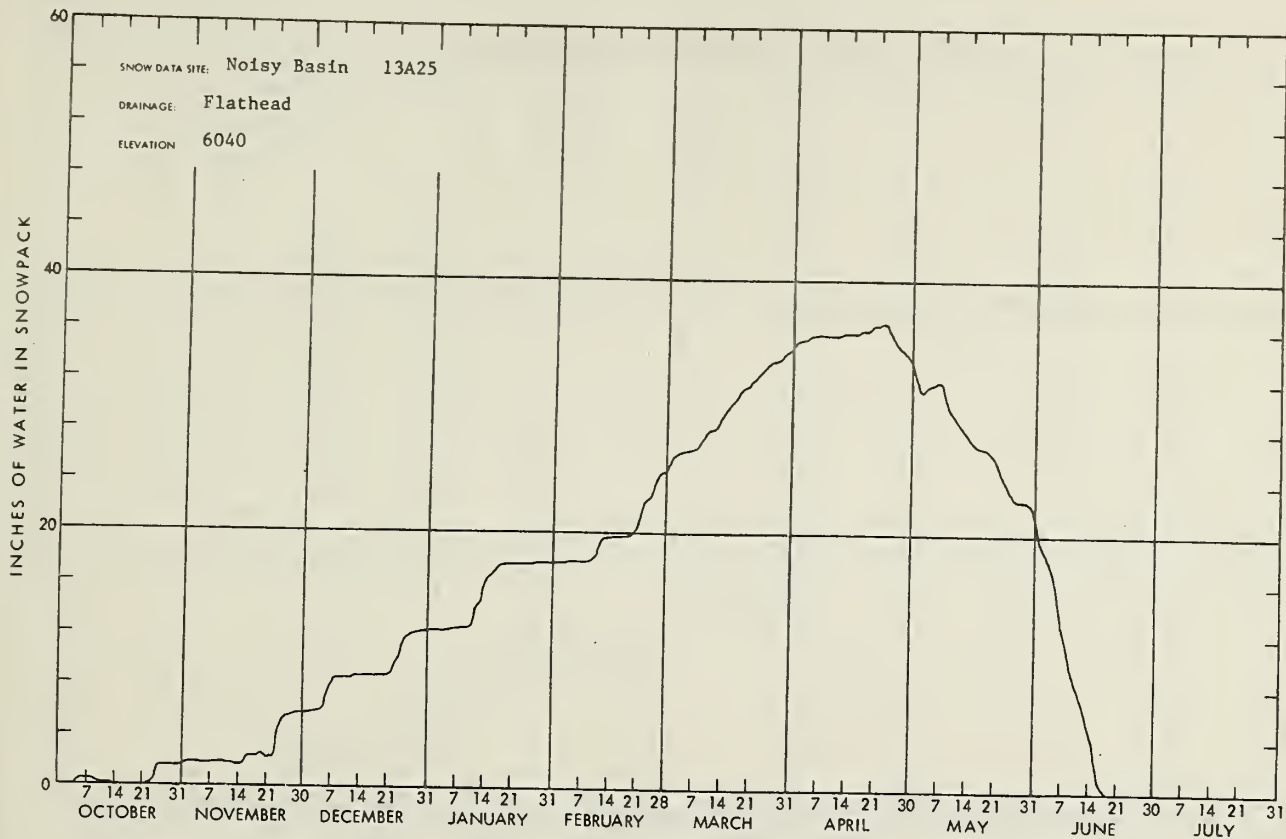


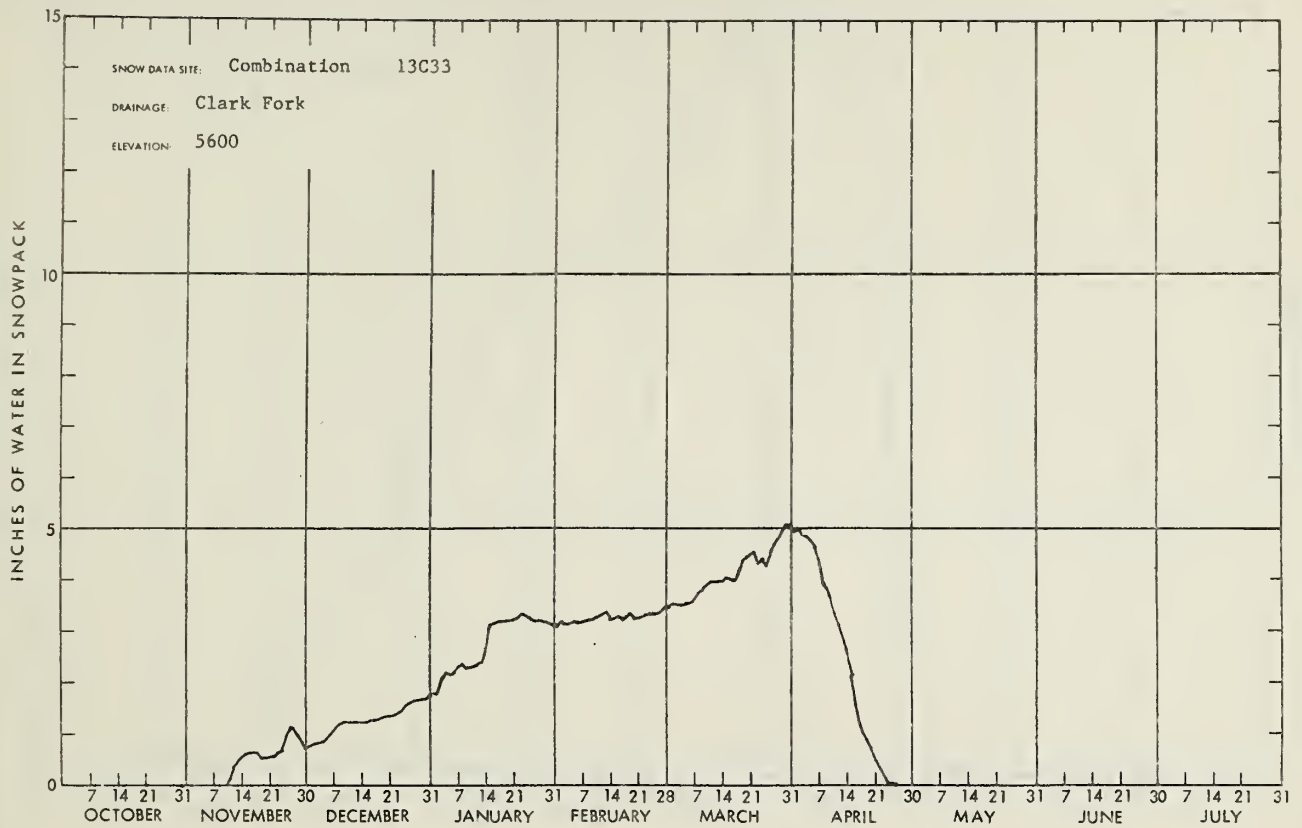




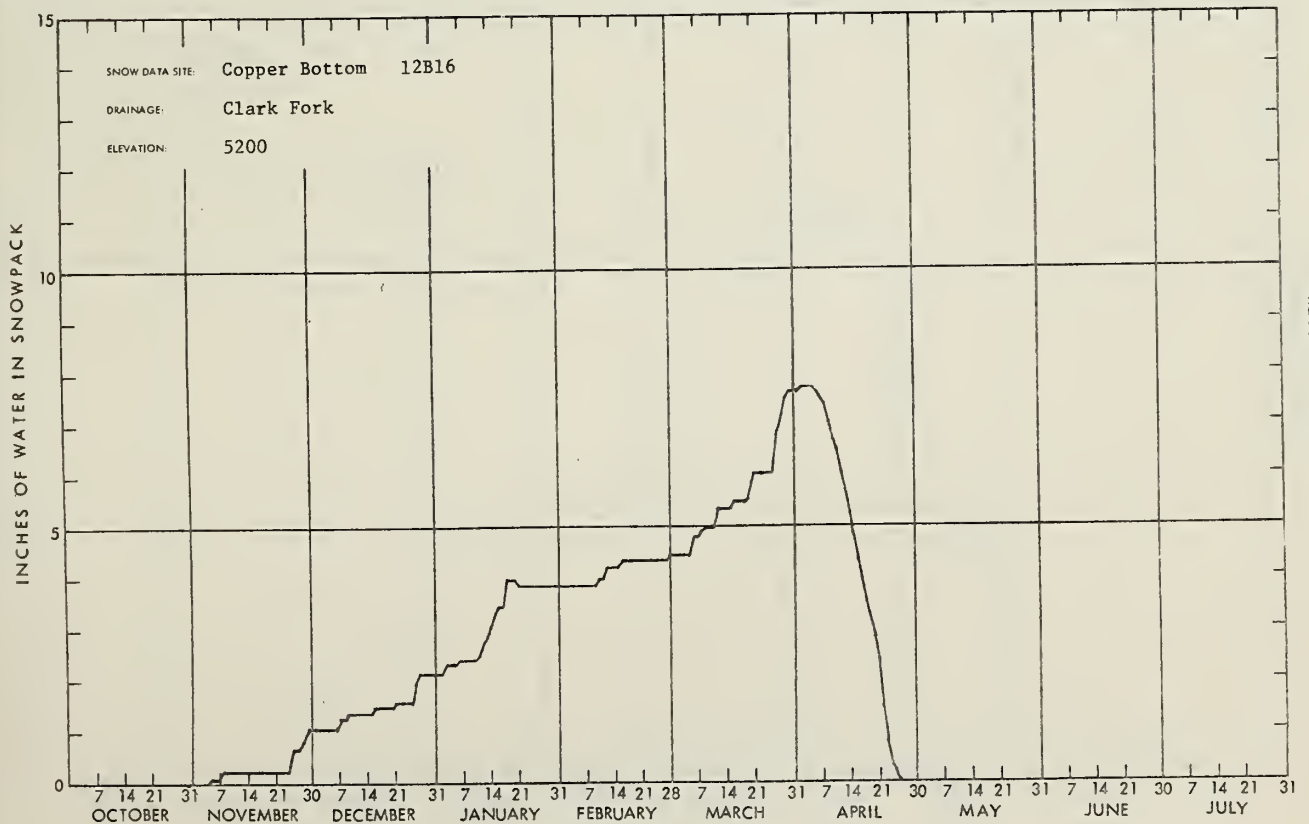


SNOW PILLOW DATA
Water Year 1977SNOW PILLOW DATA
Water Year 1977

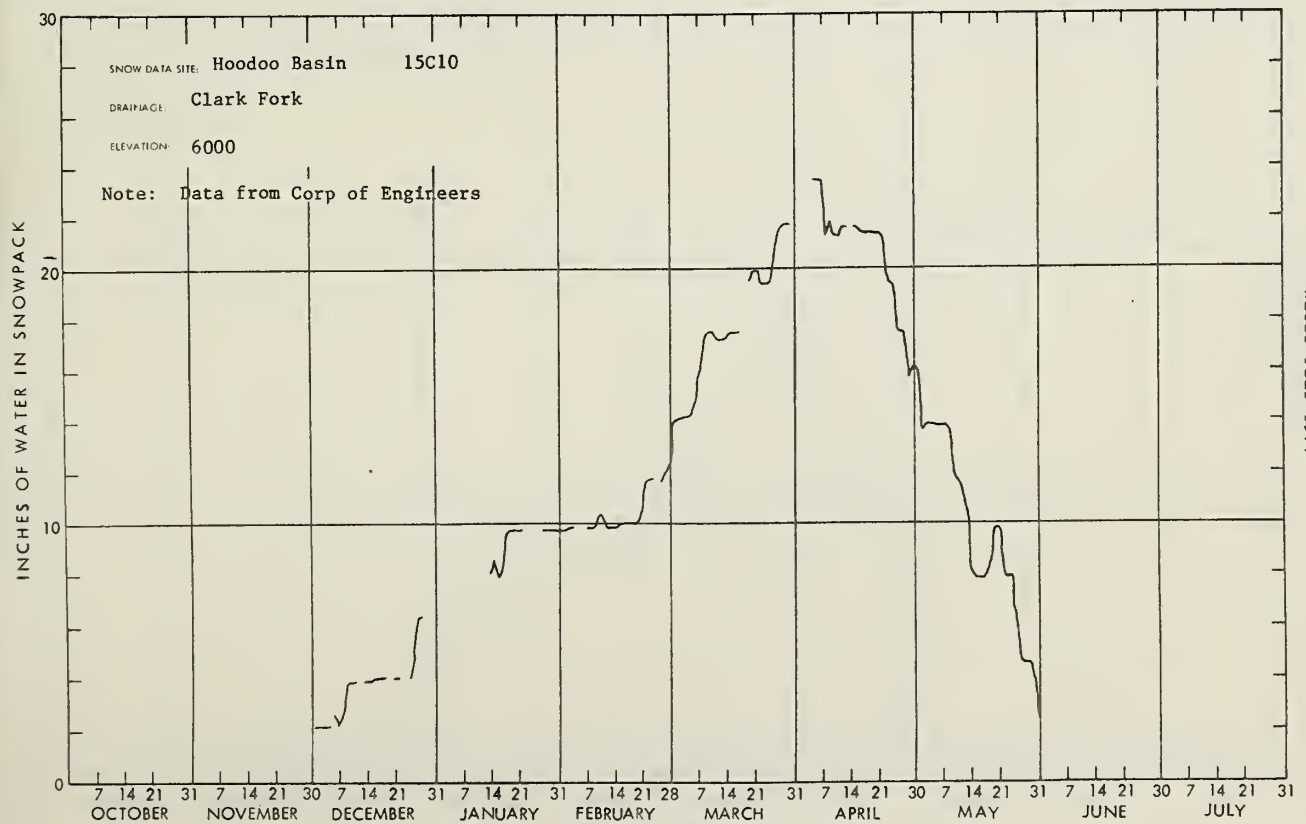
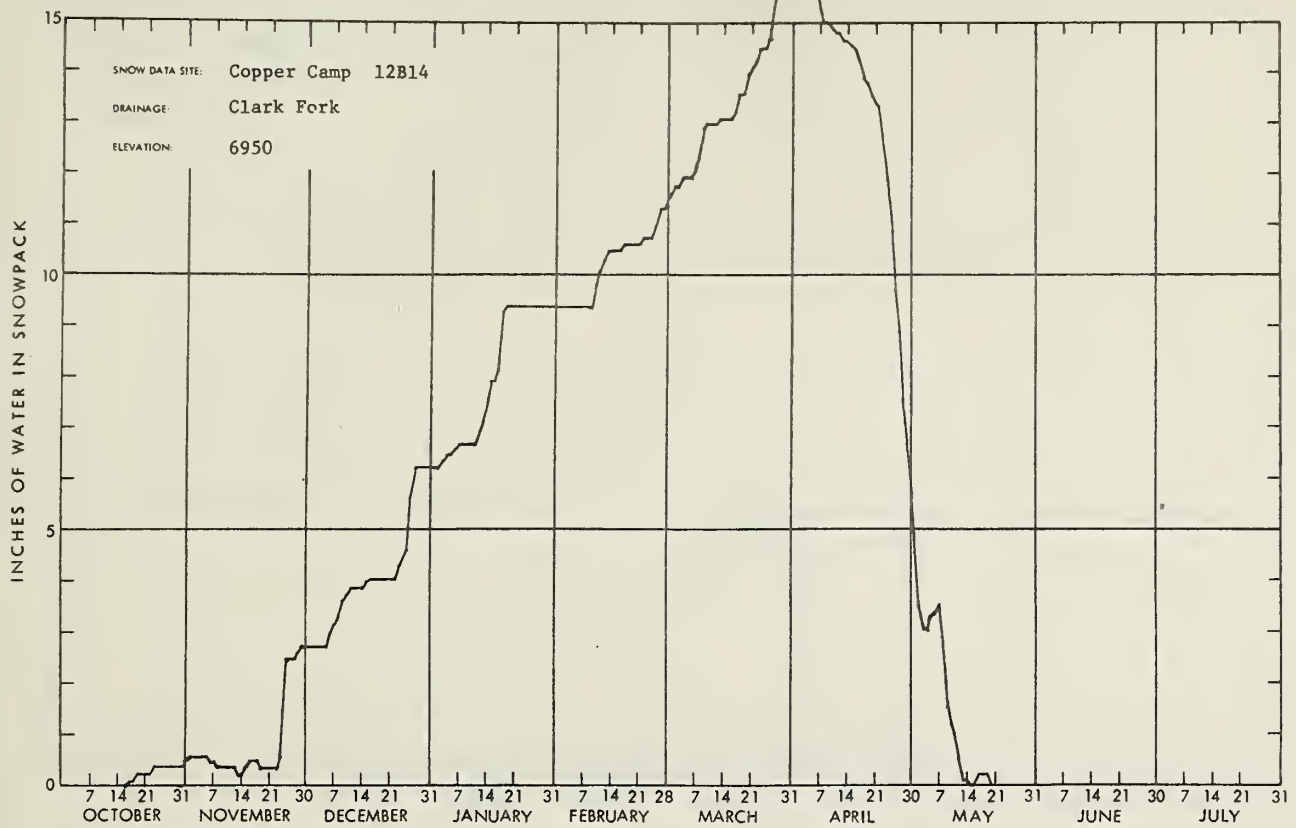


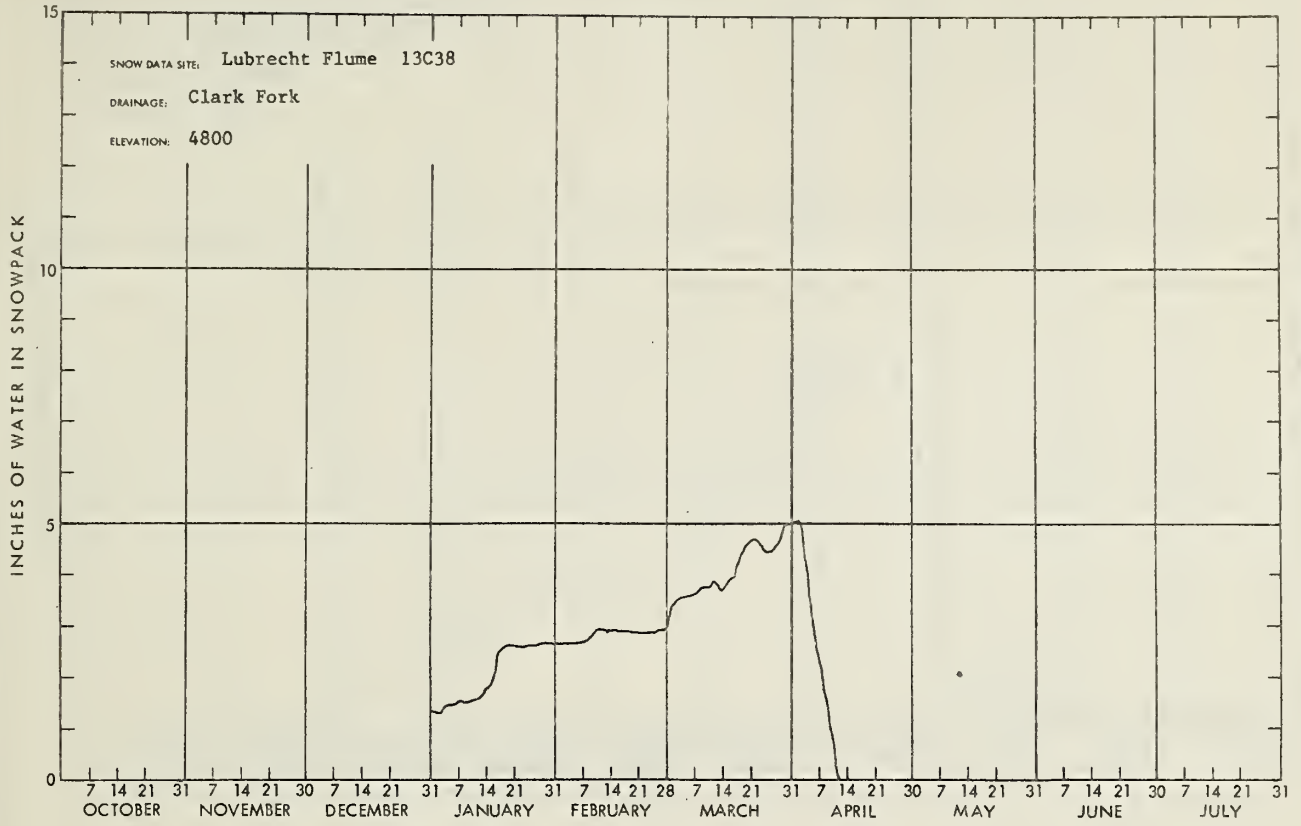


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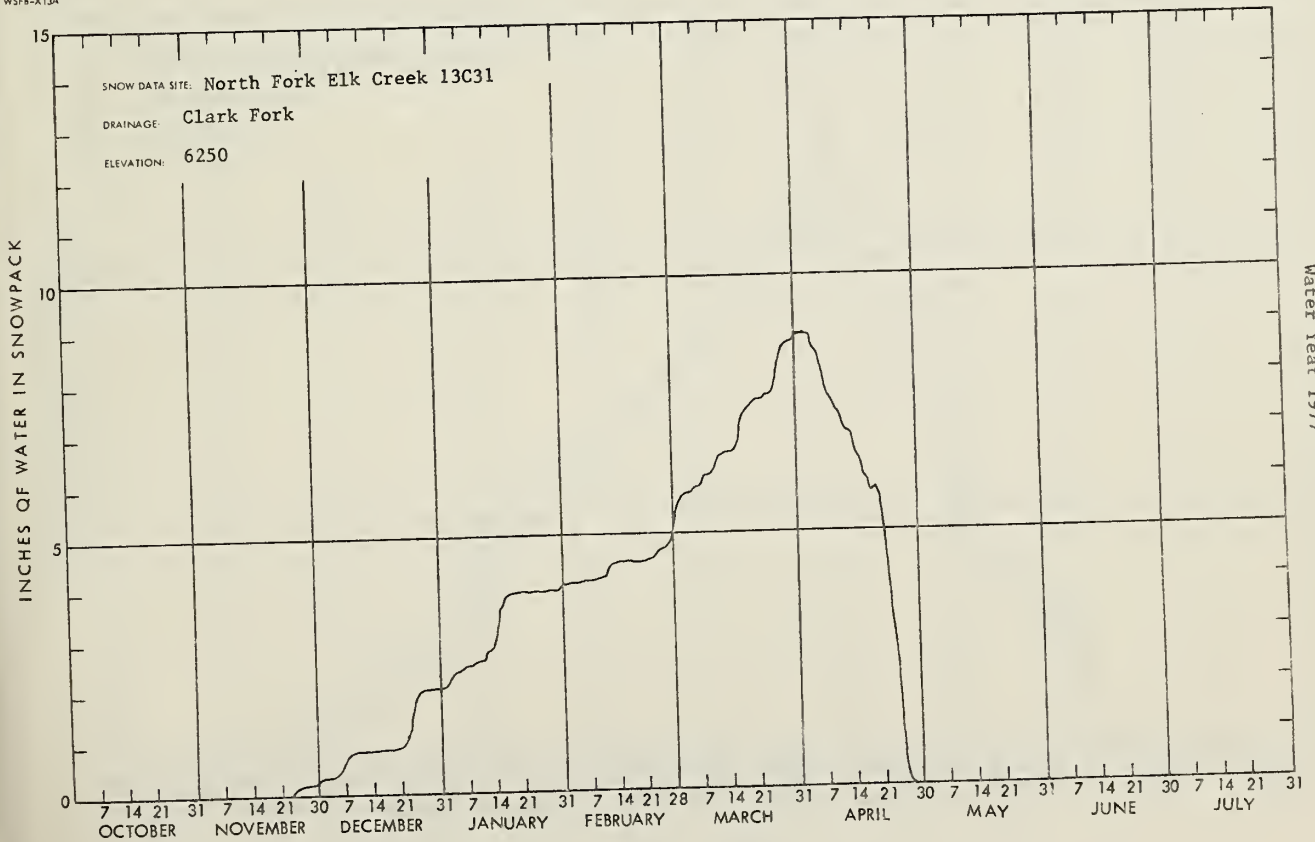


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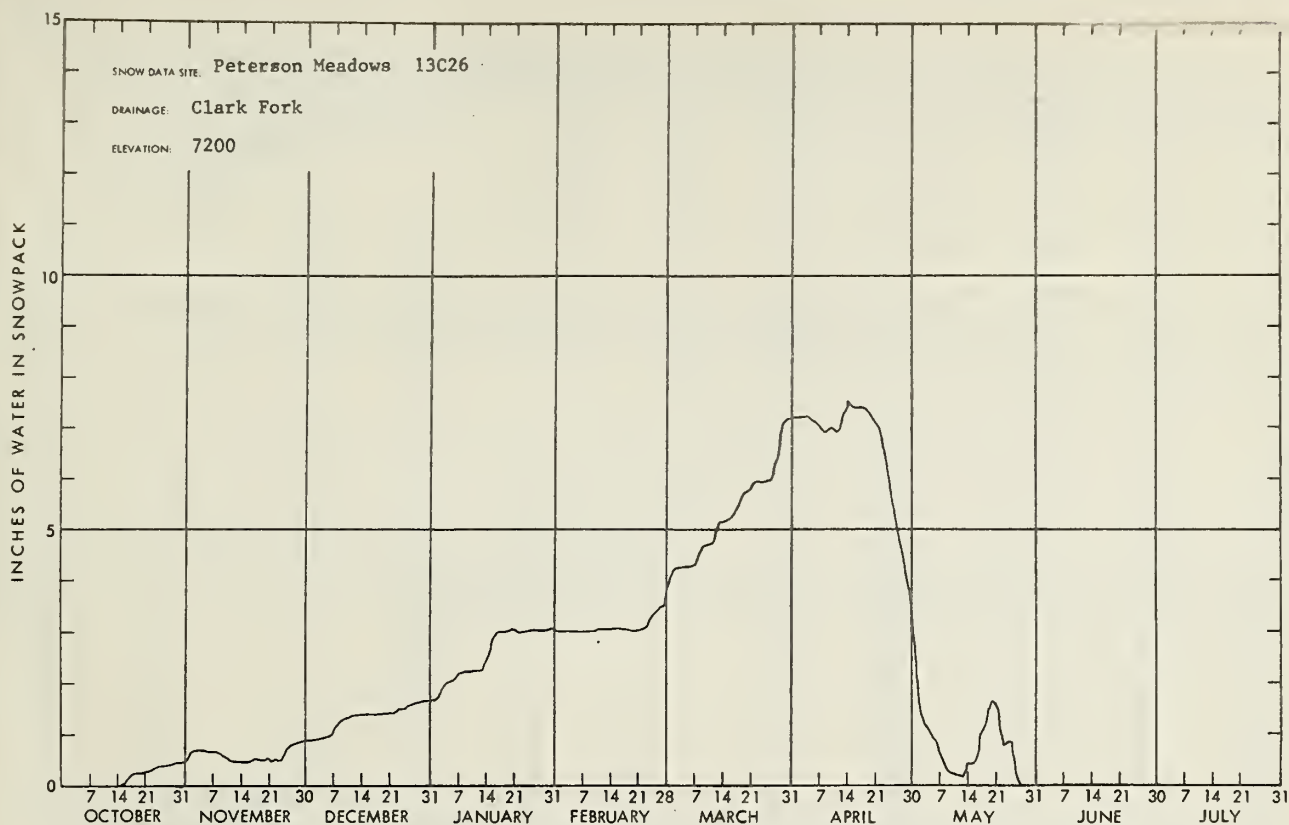




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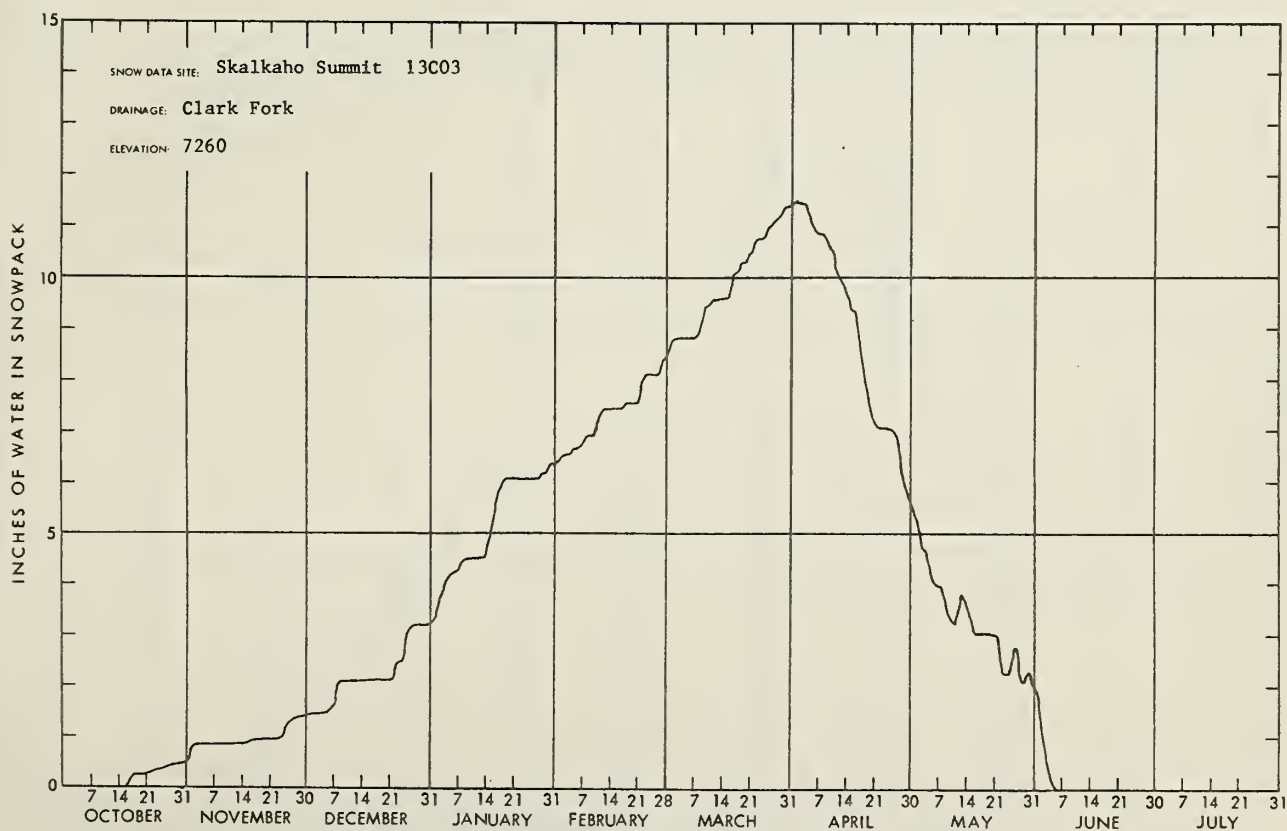


SNOW PILLOW DATA
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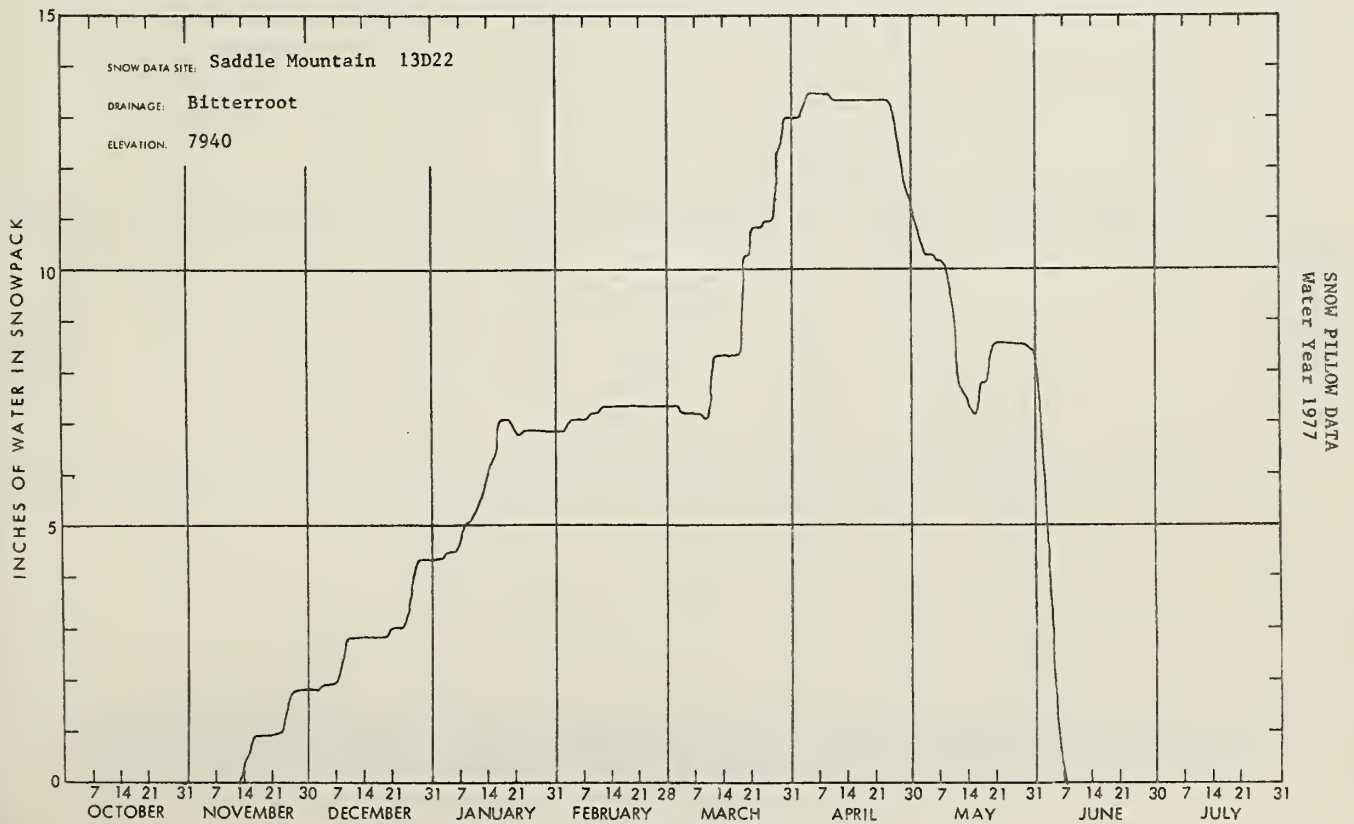
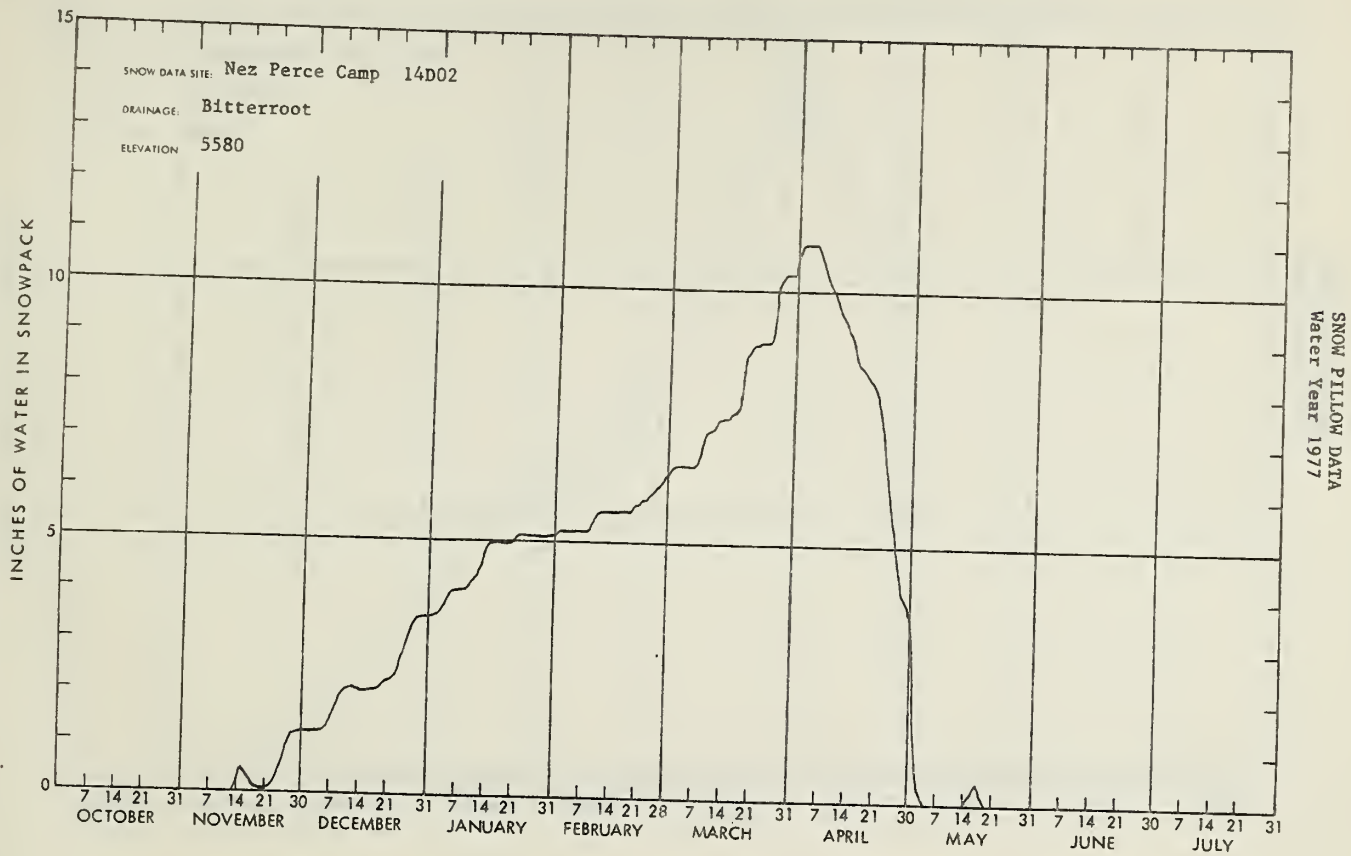


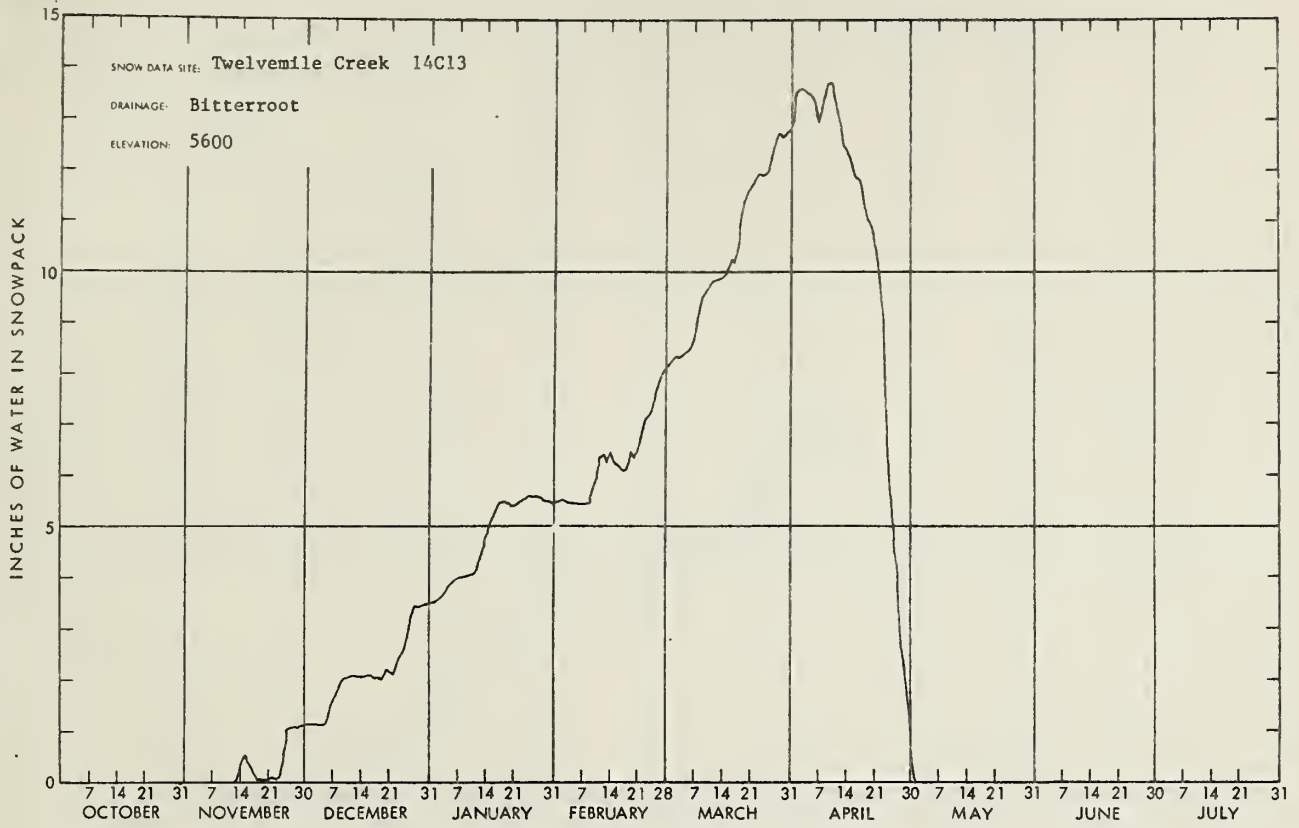
SNOW PILLOW DATA
Water Year 1977

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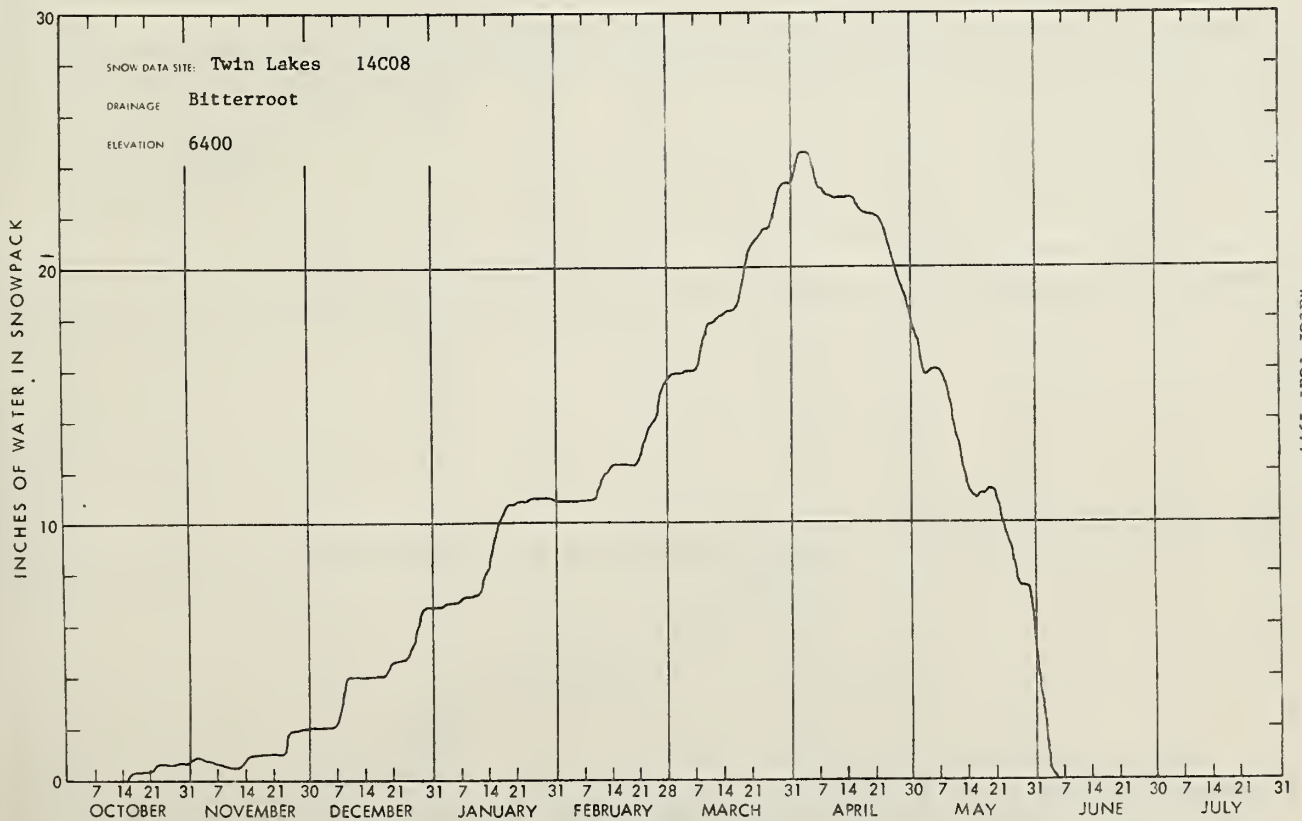
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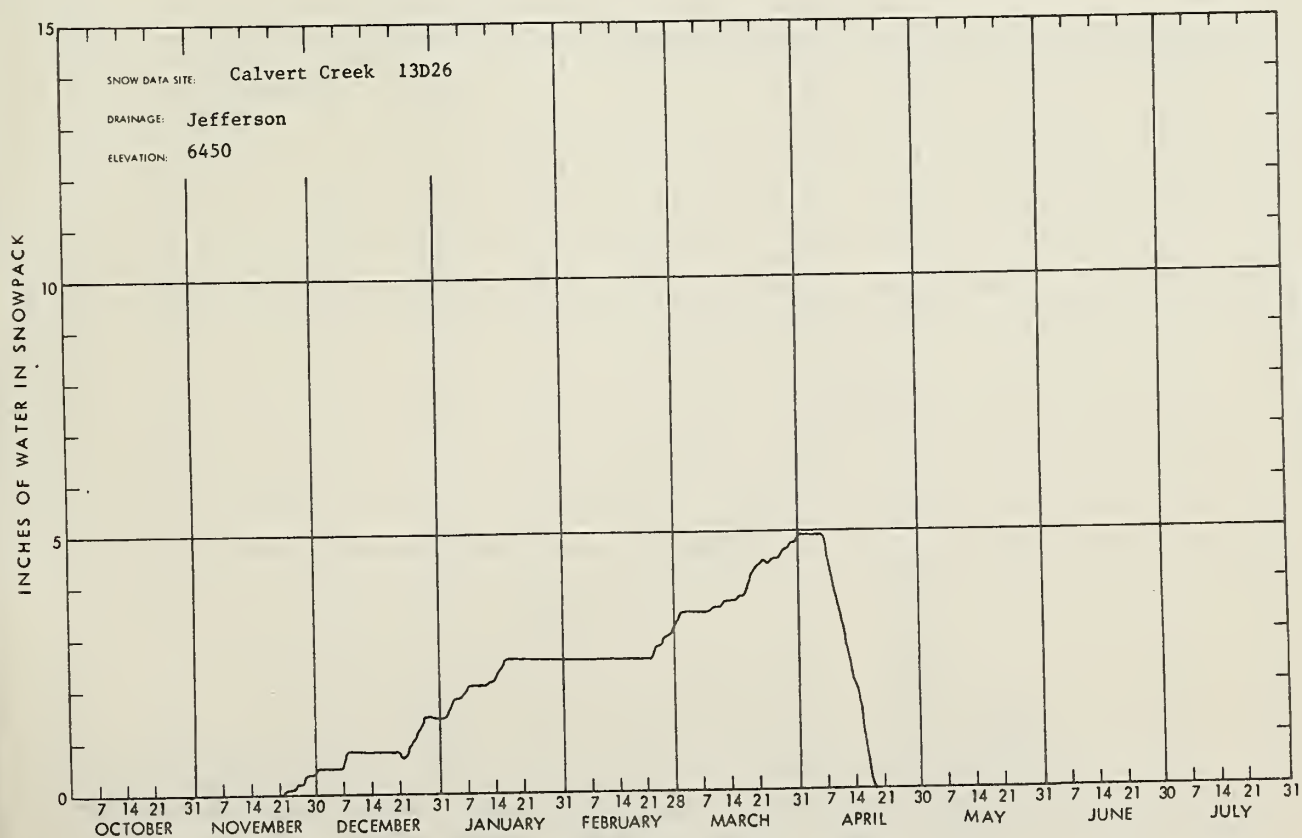
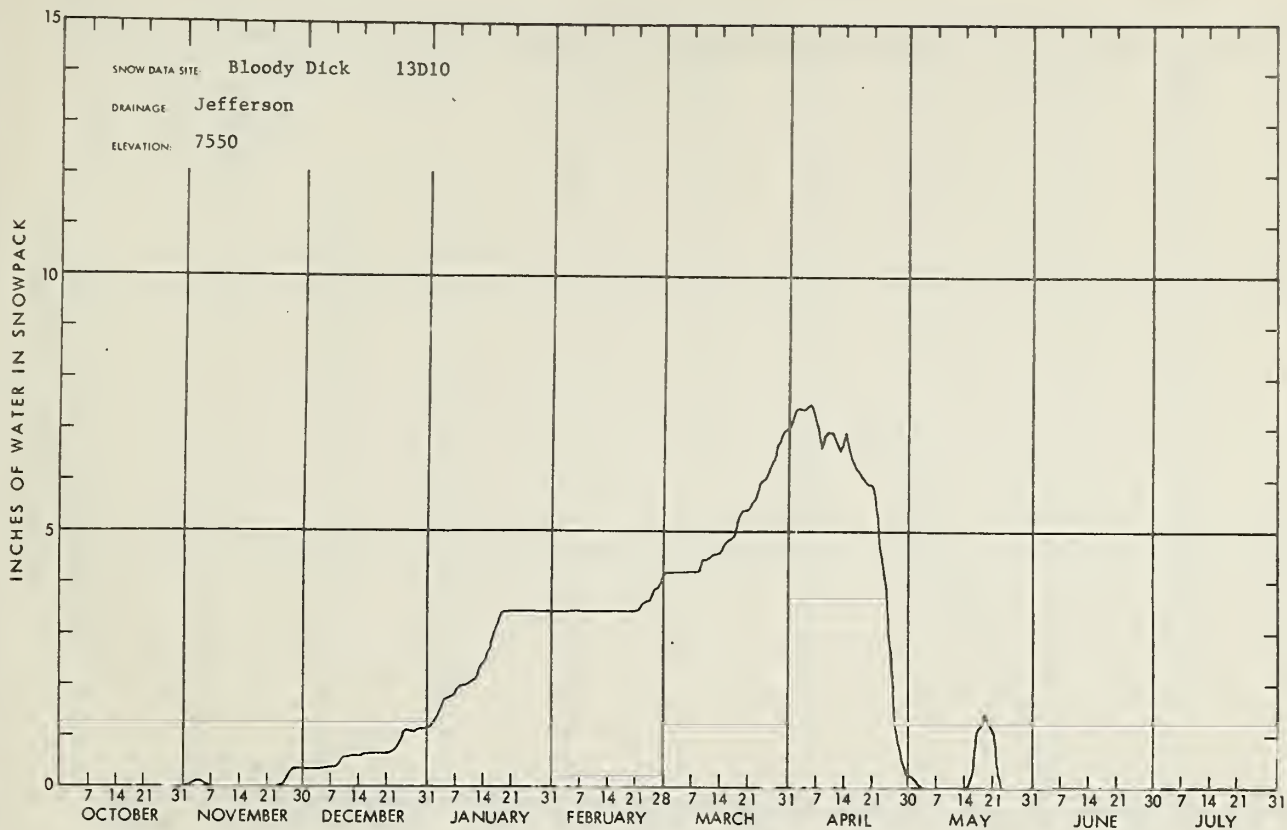


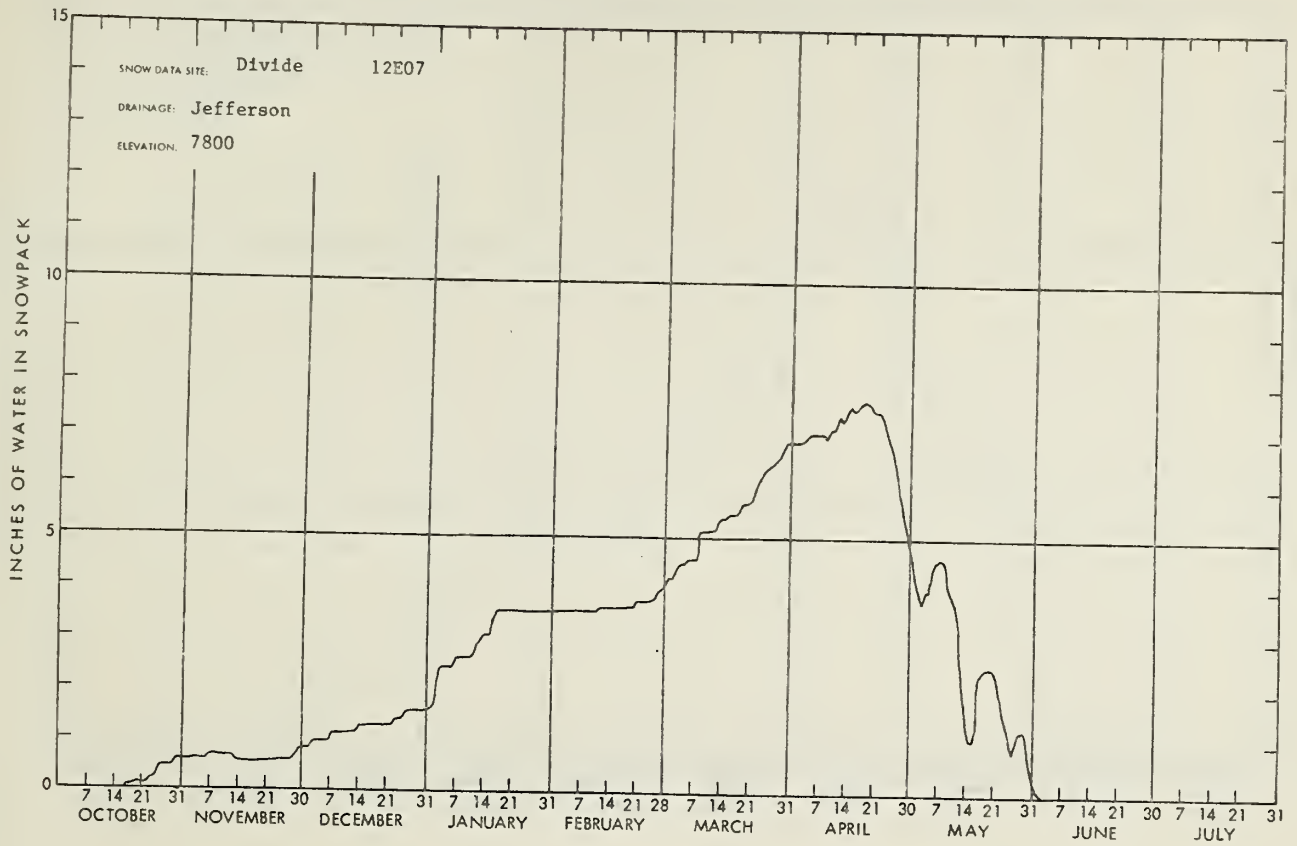
SNOW PILLION DATA
Water Year 1977

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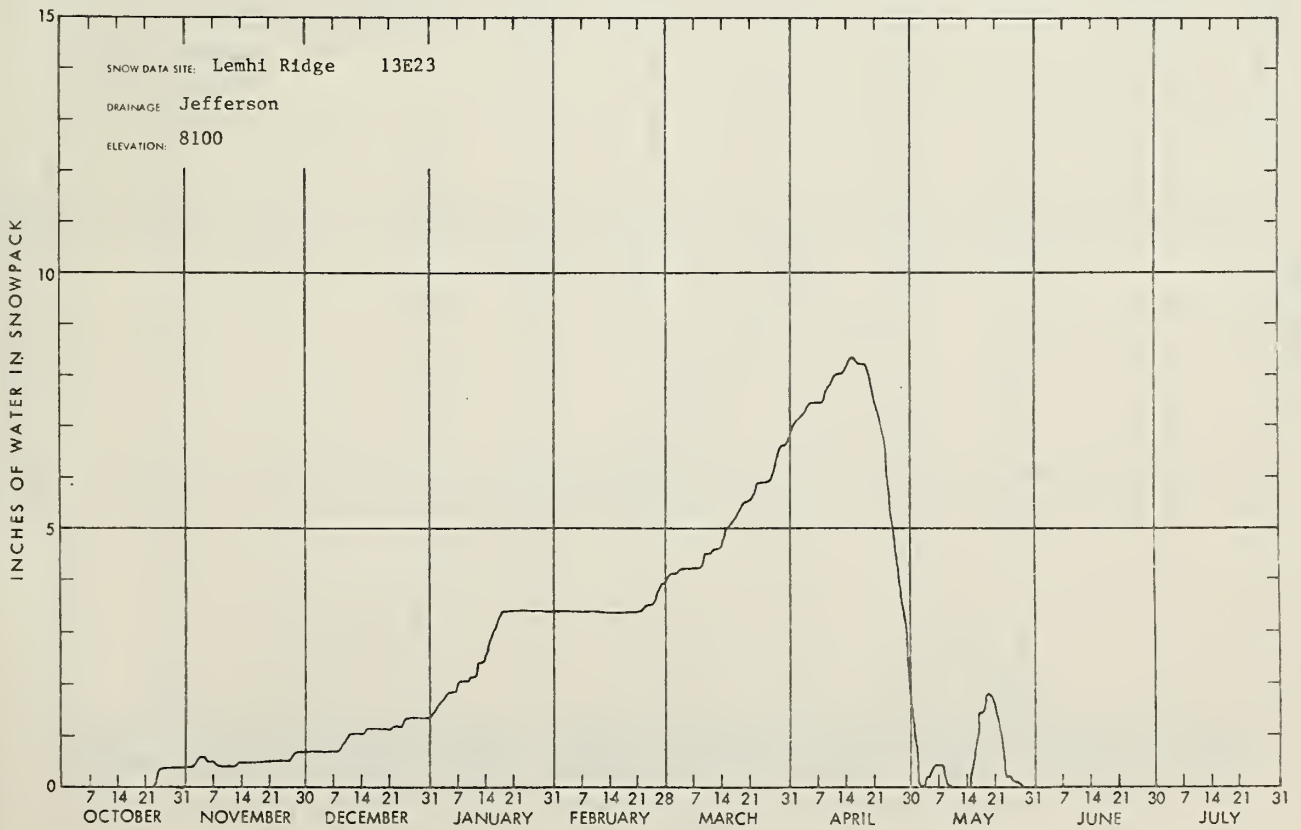


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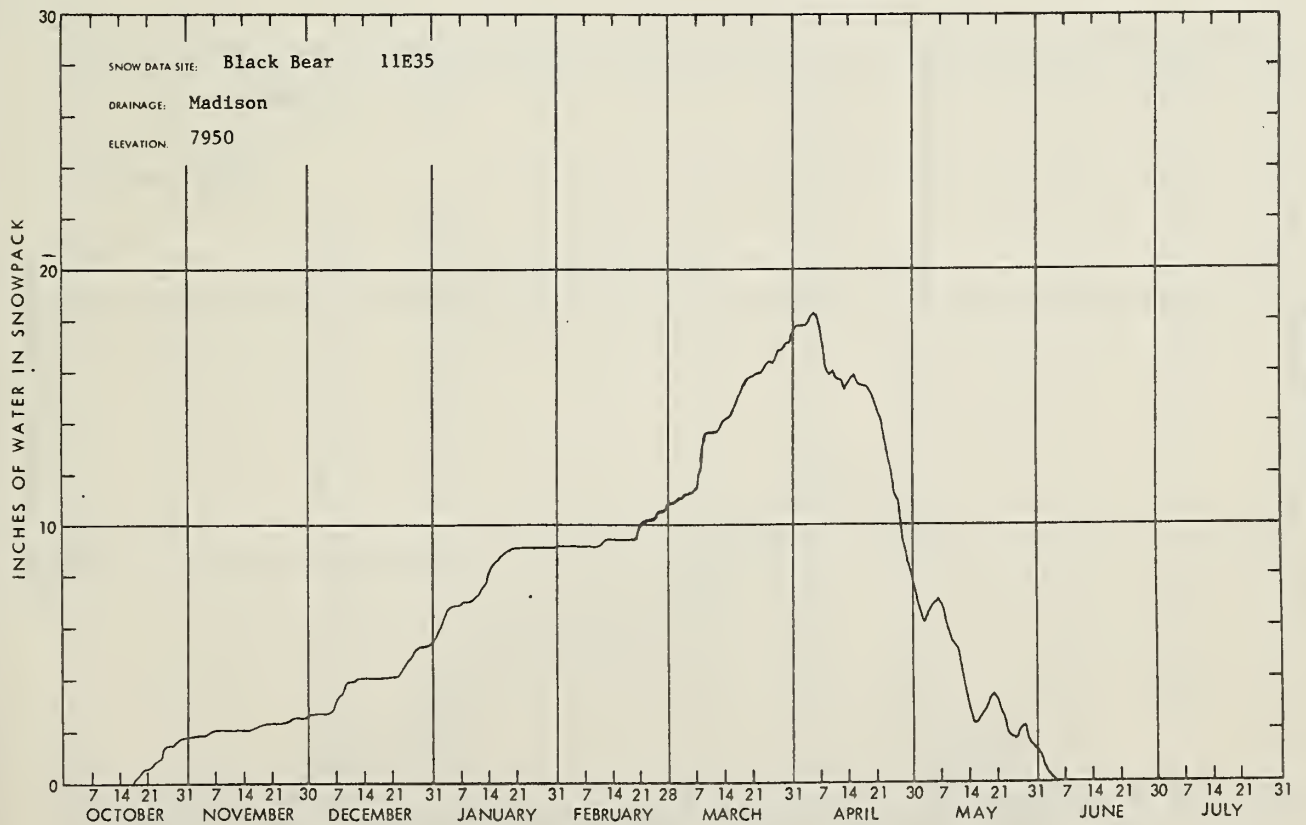
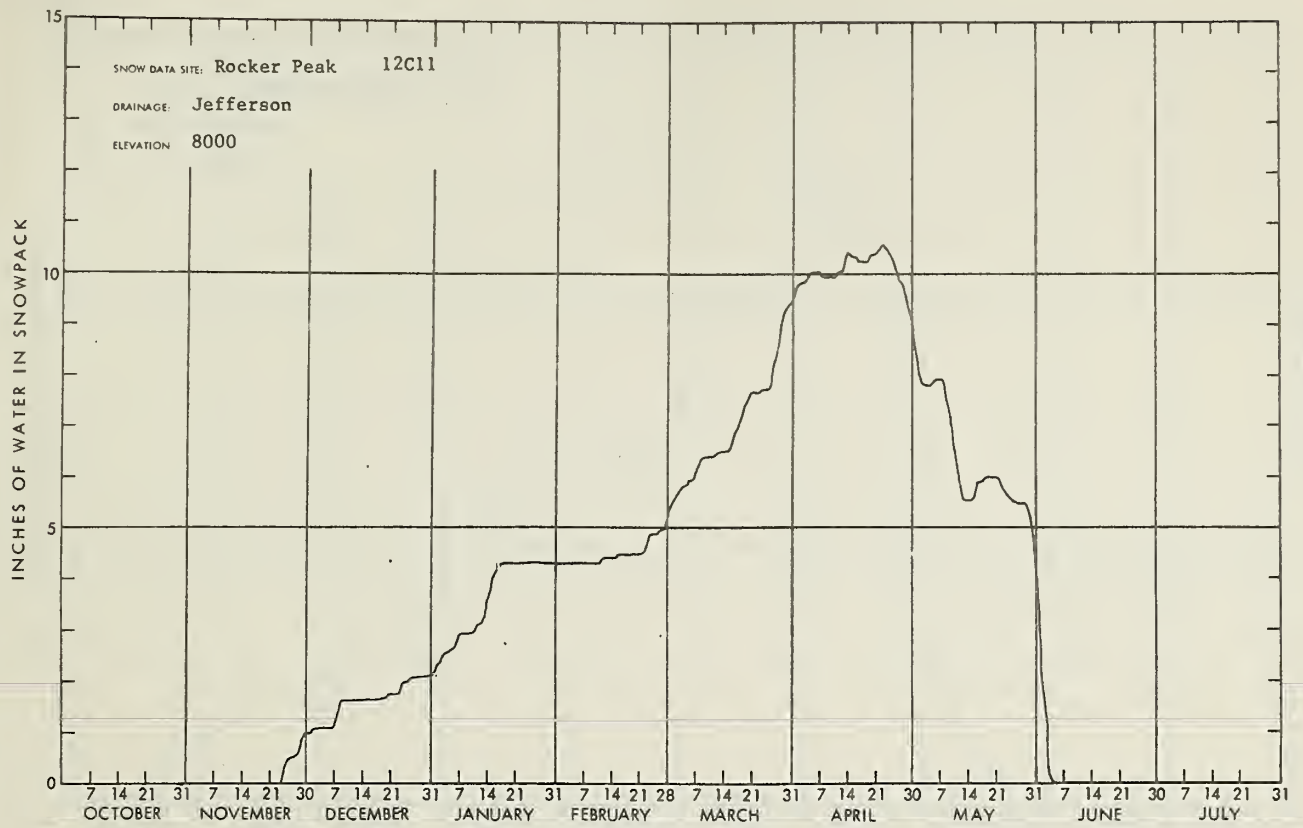


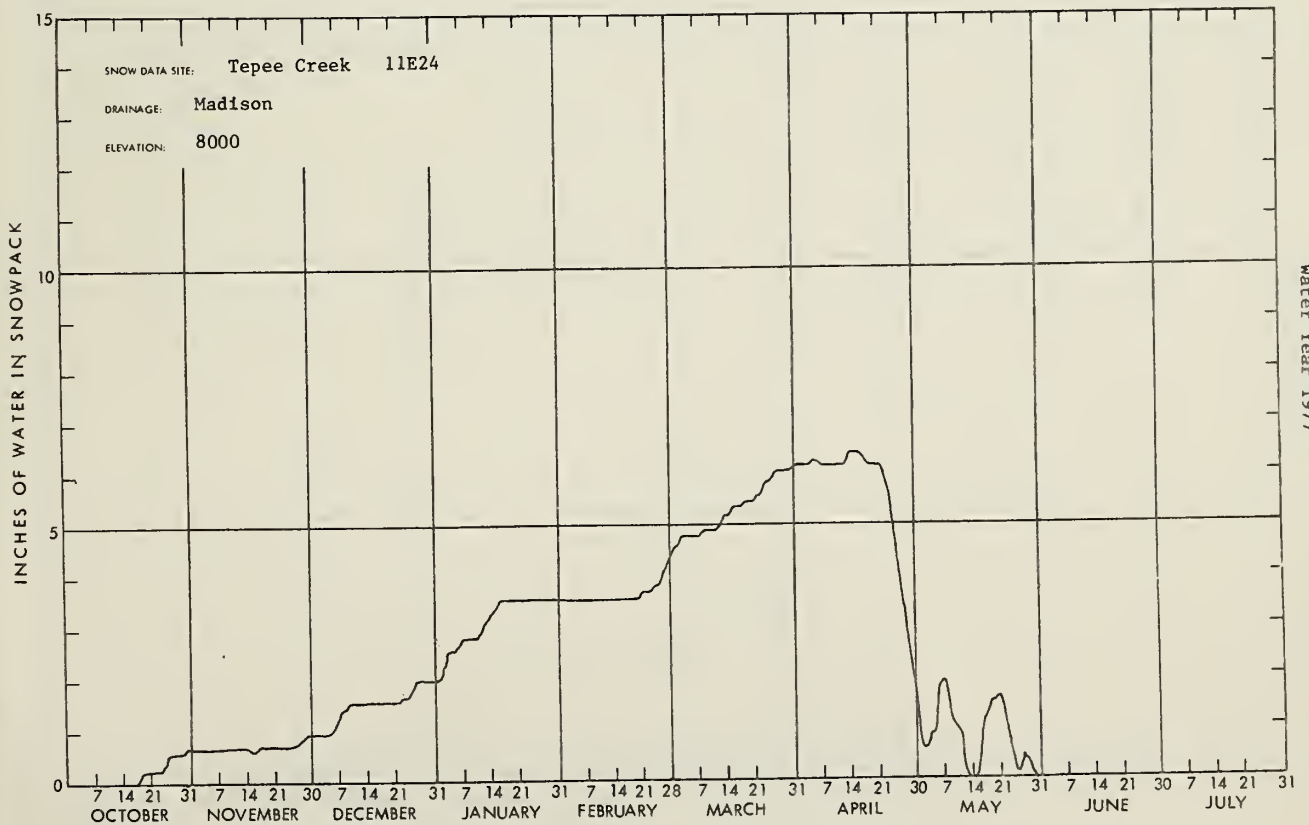
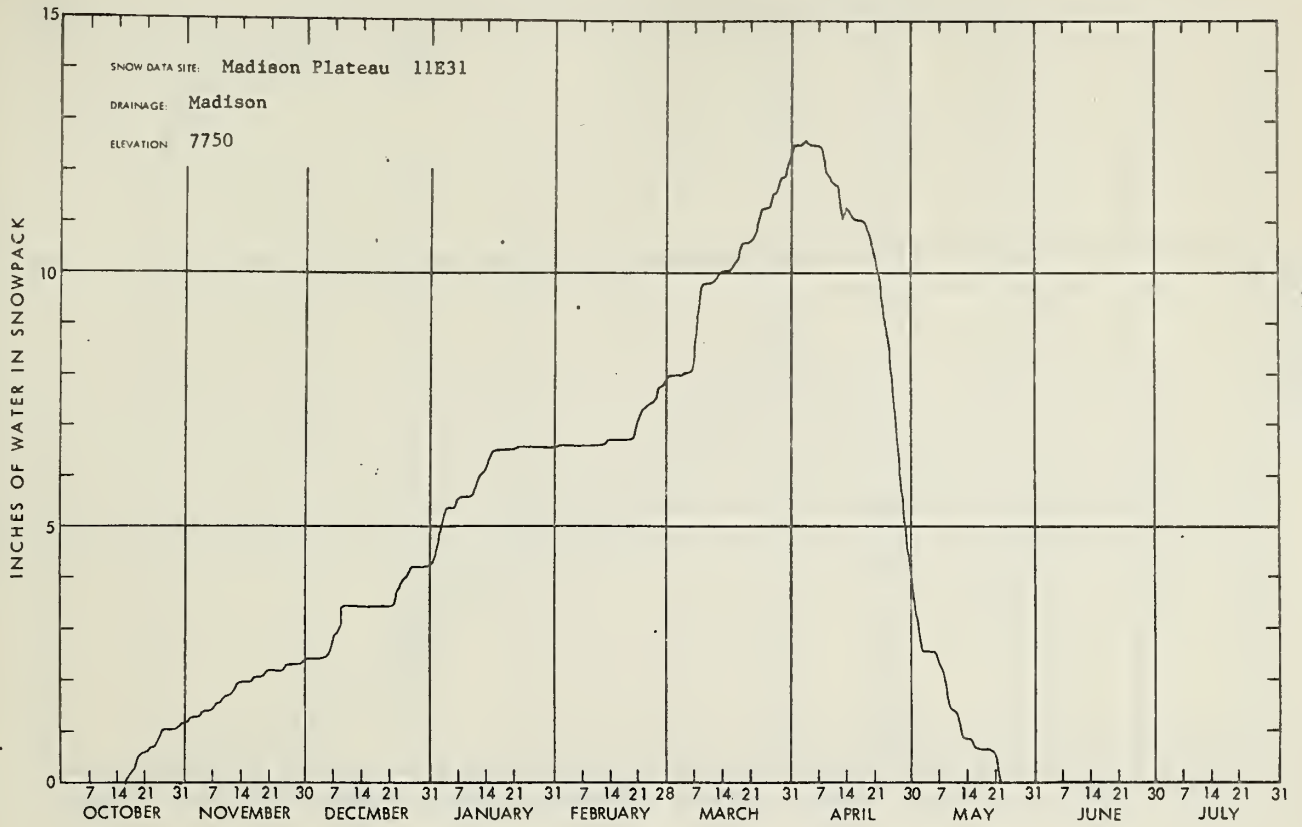


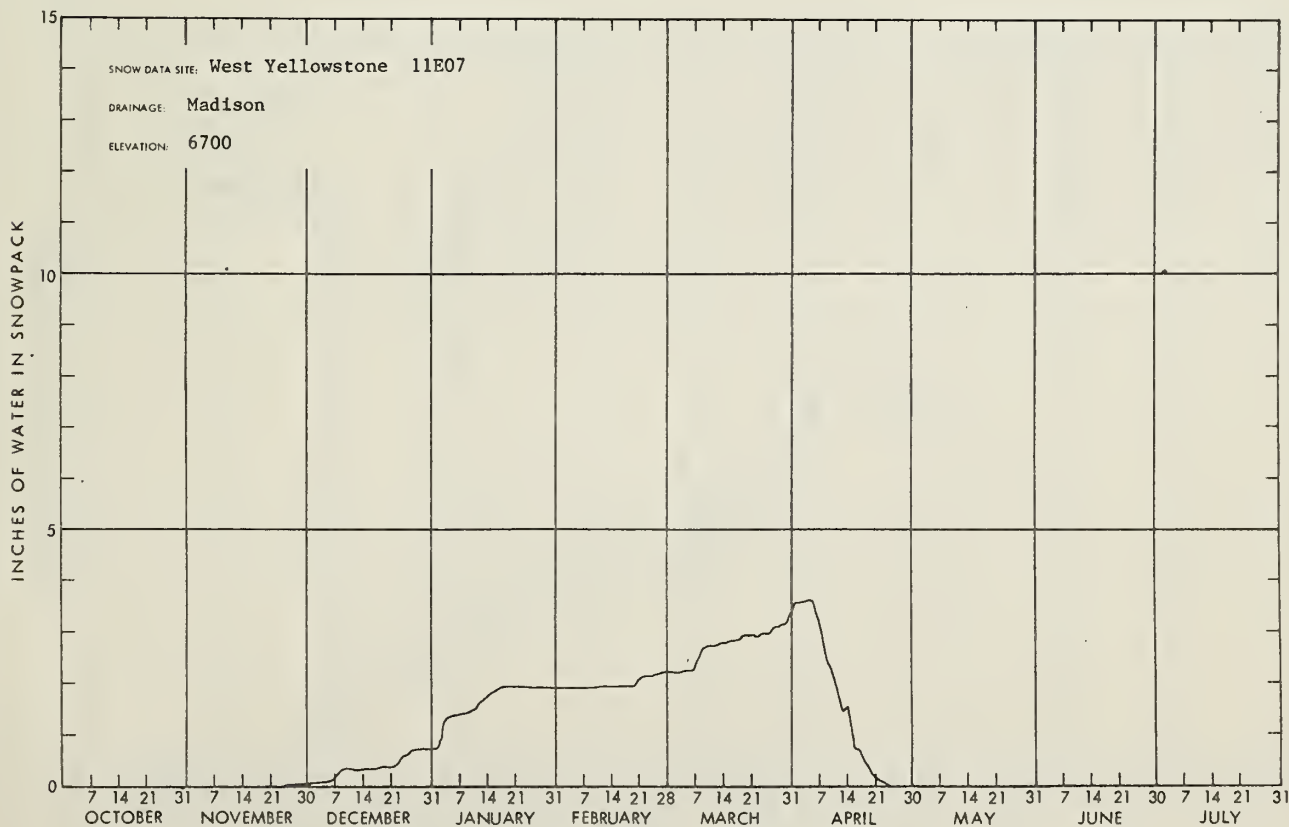
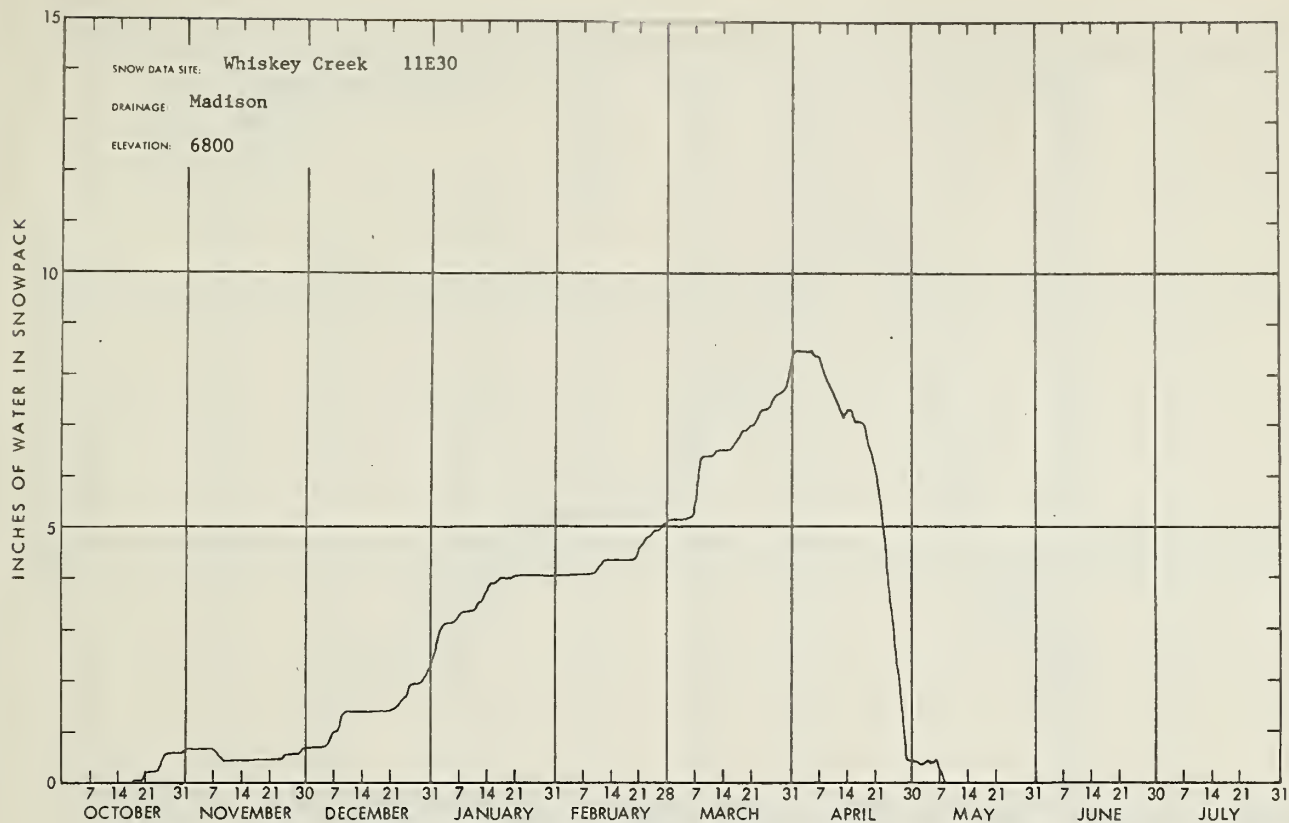
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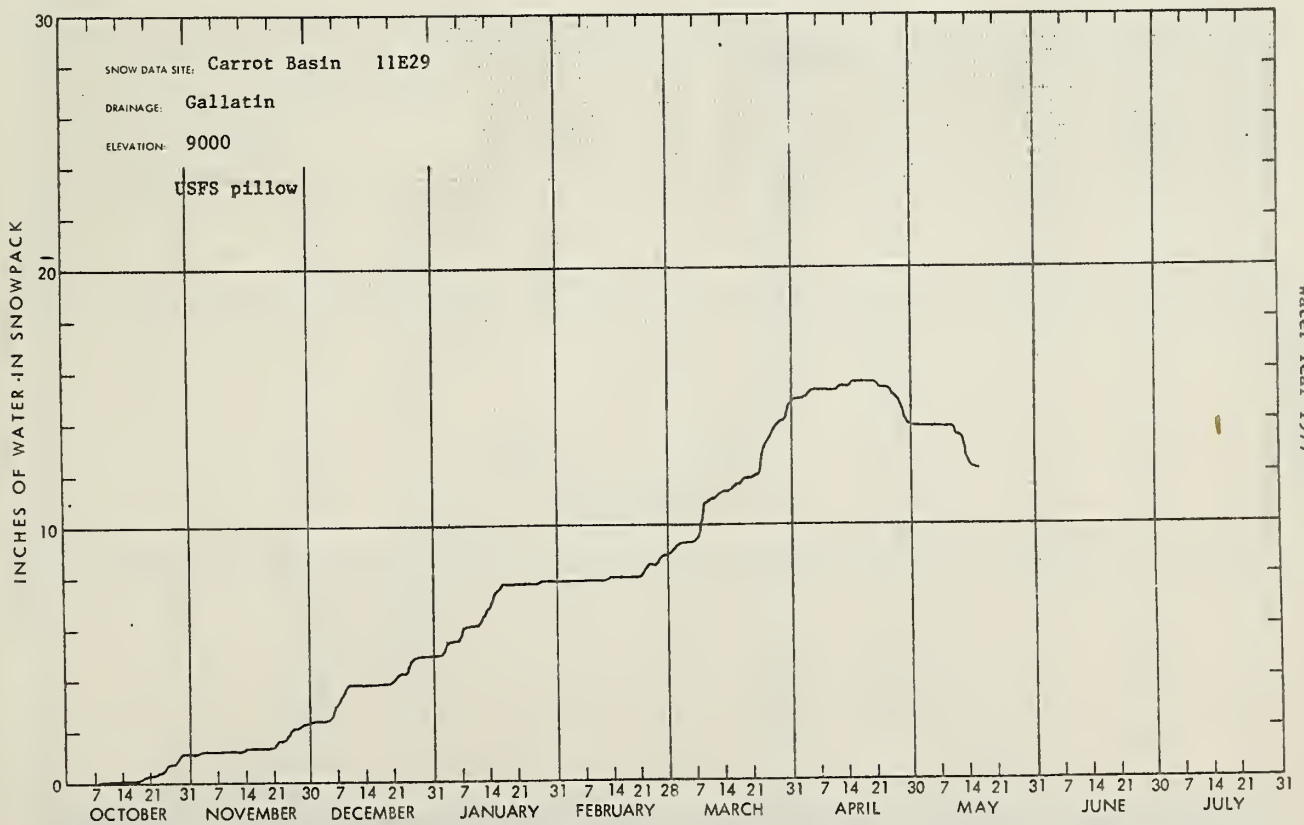
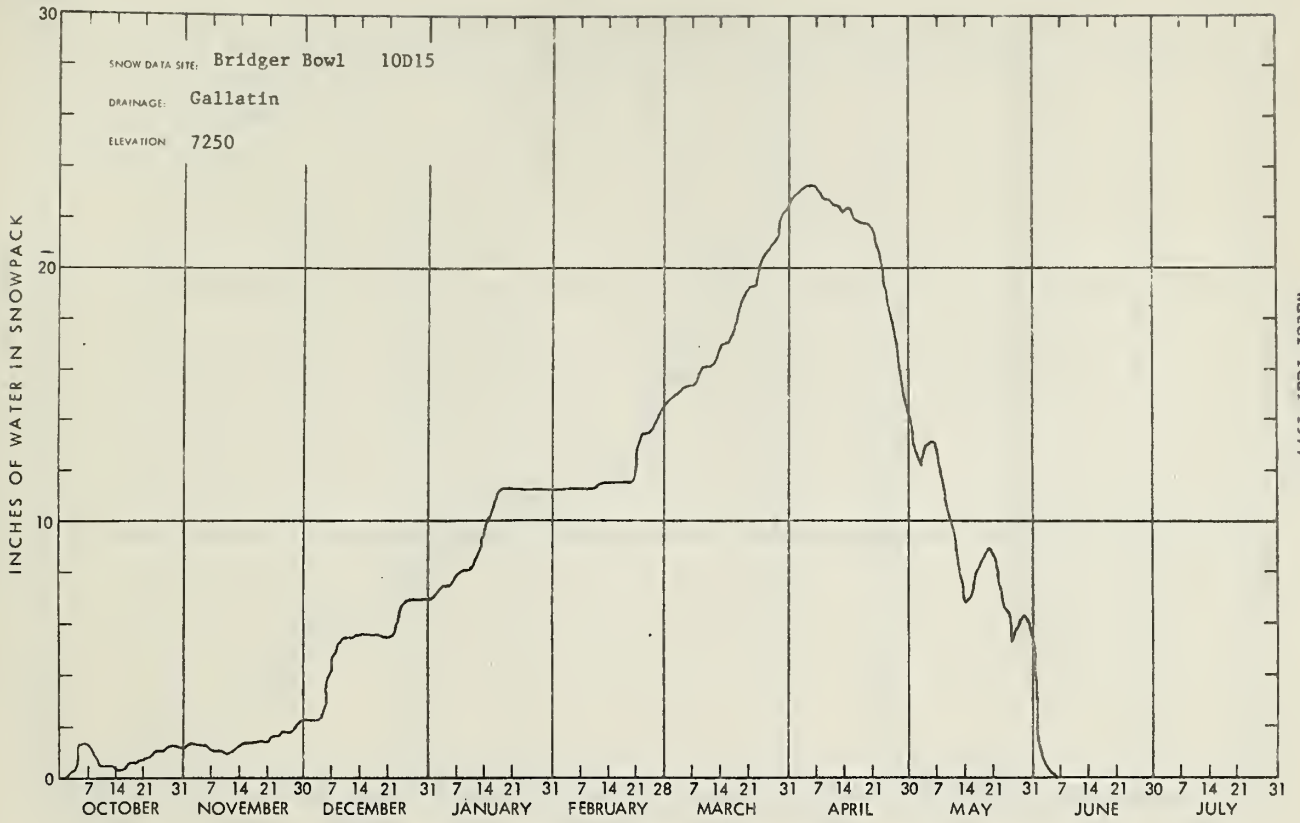


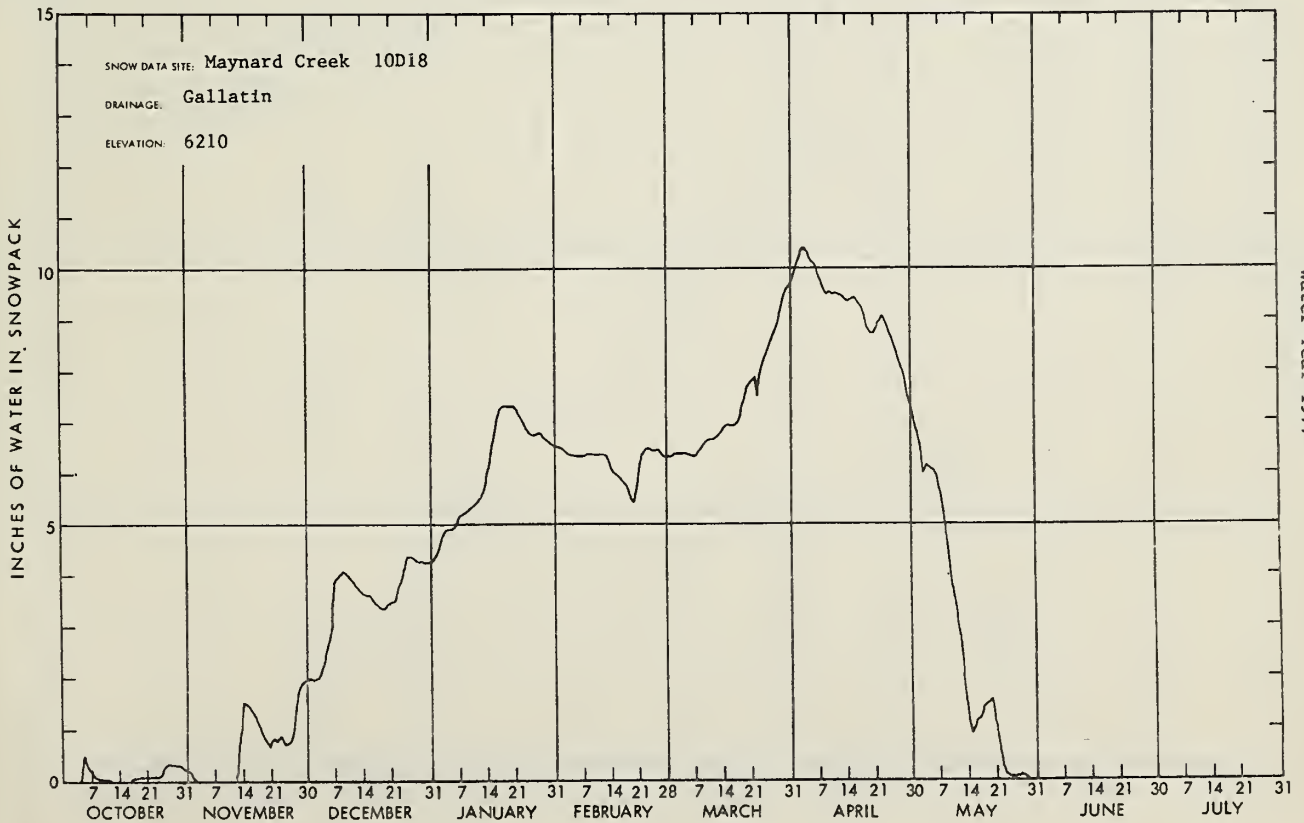
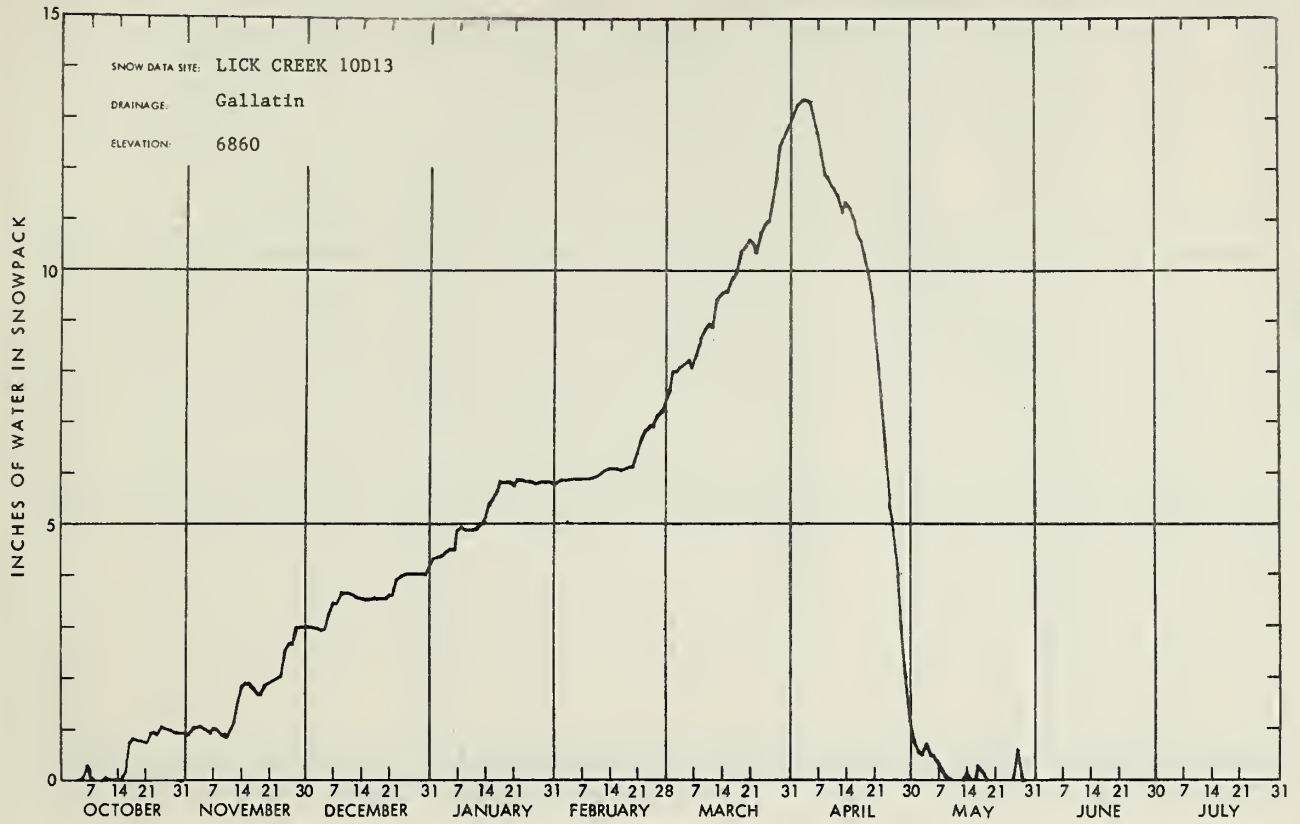
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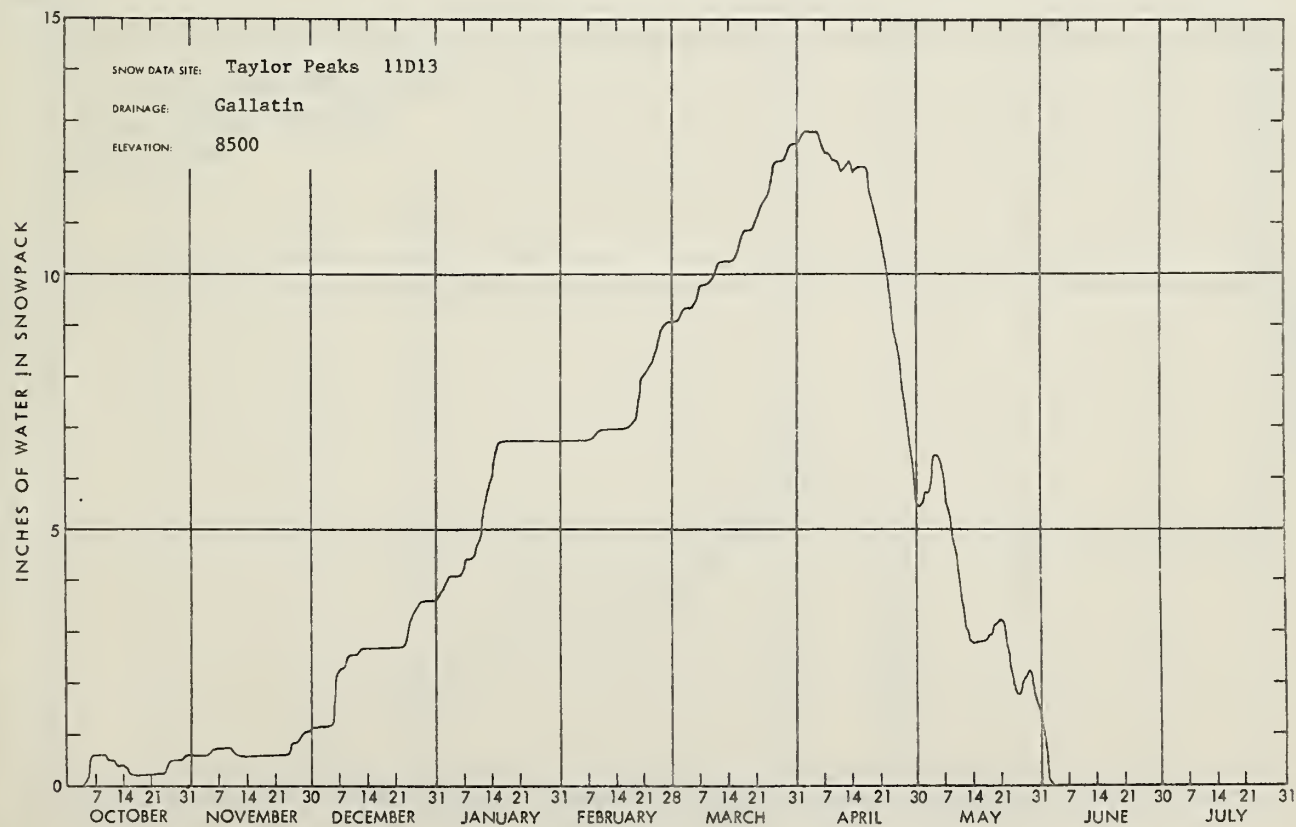
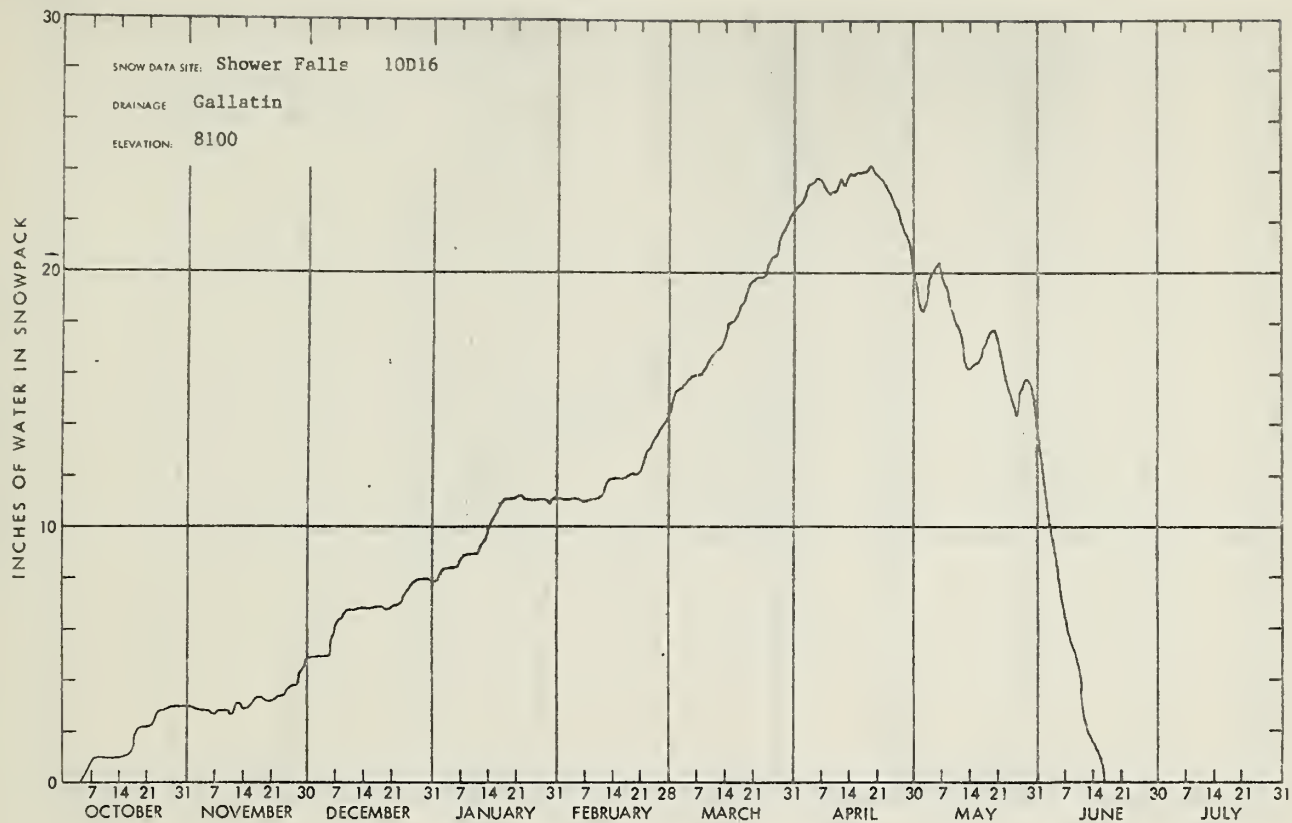


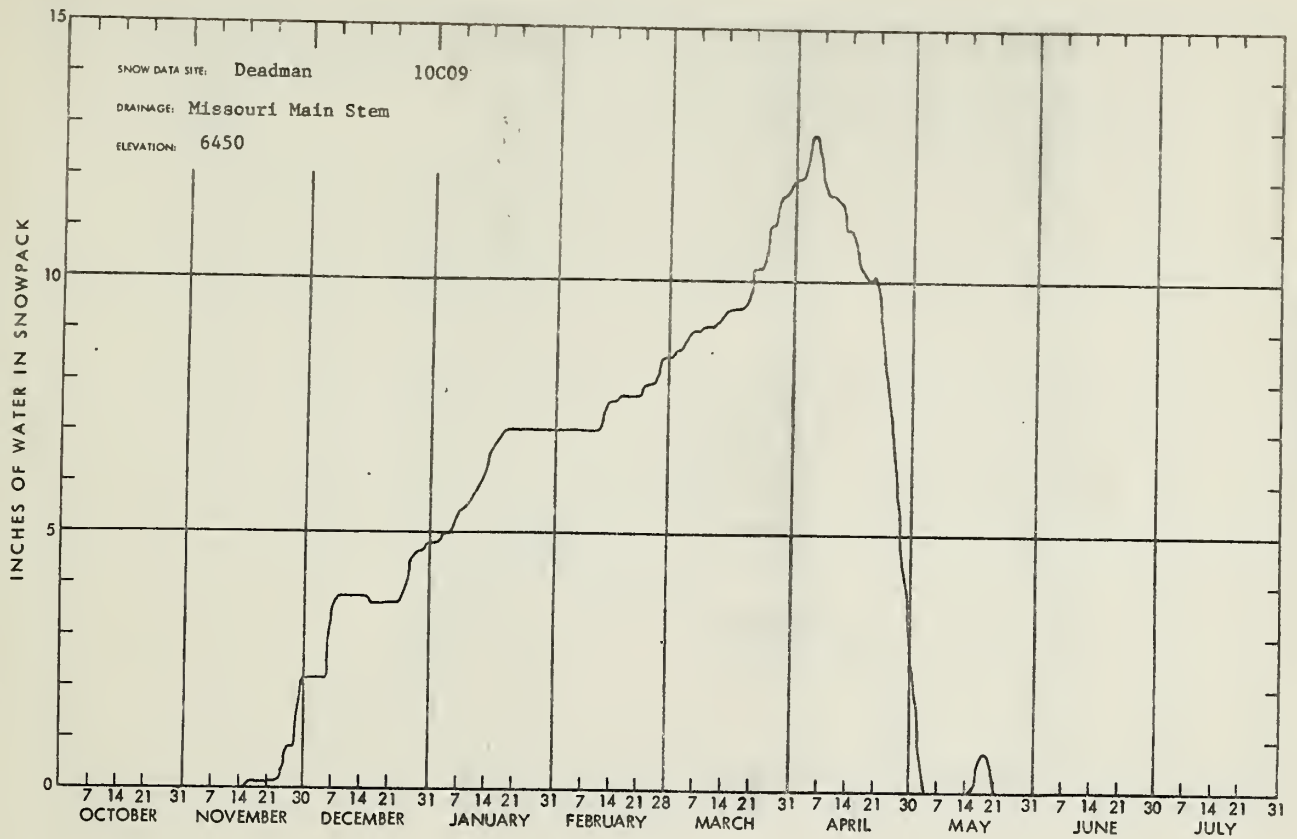




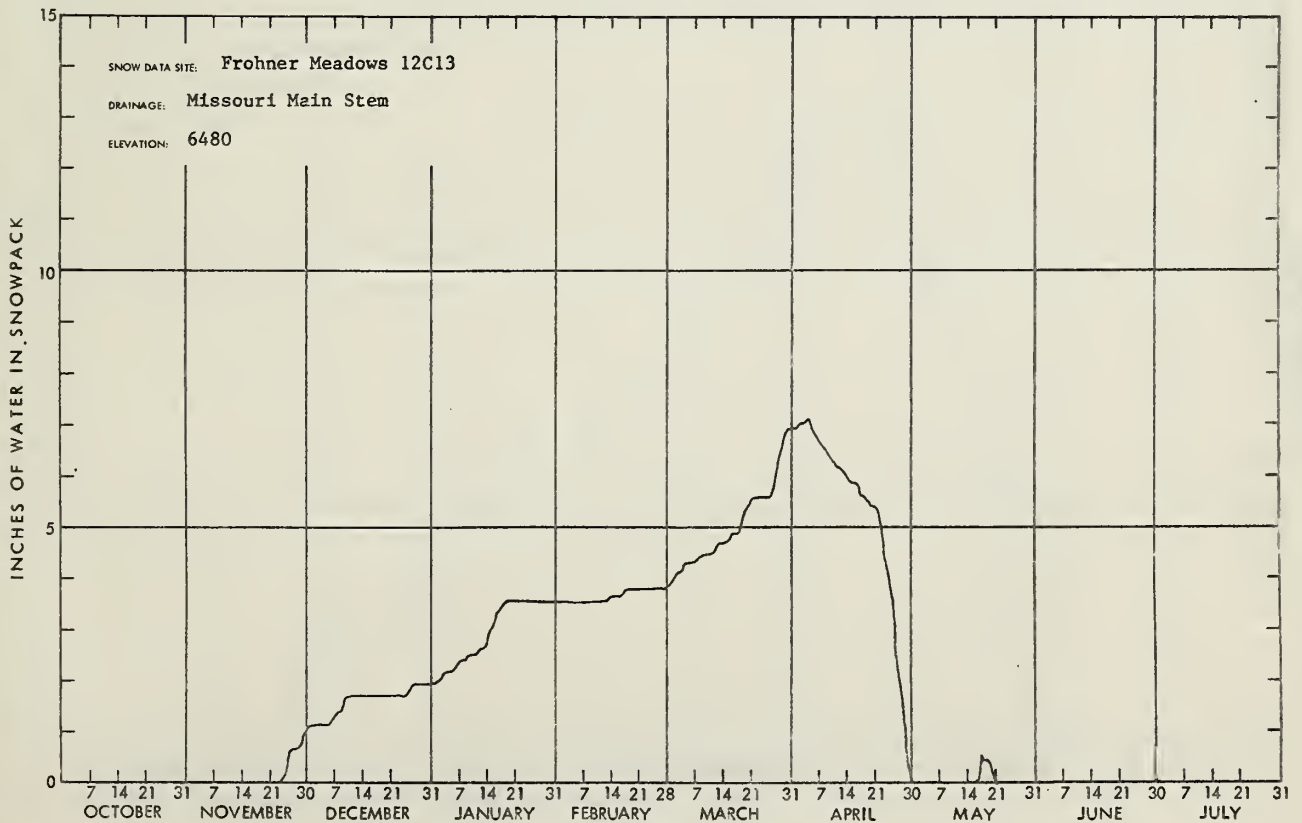




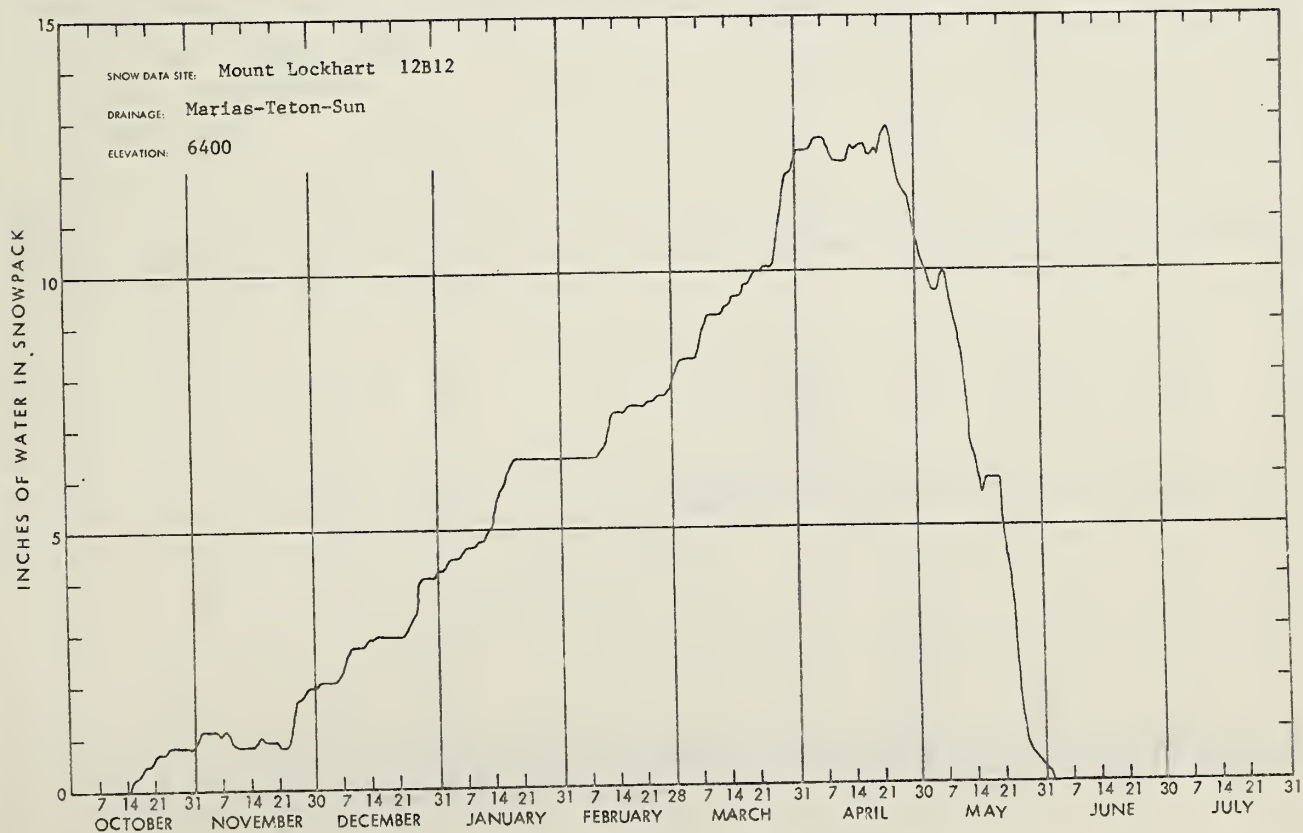
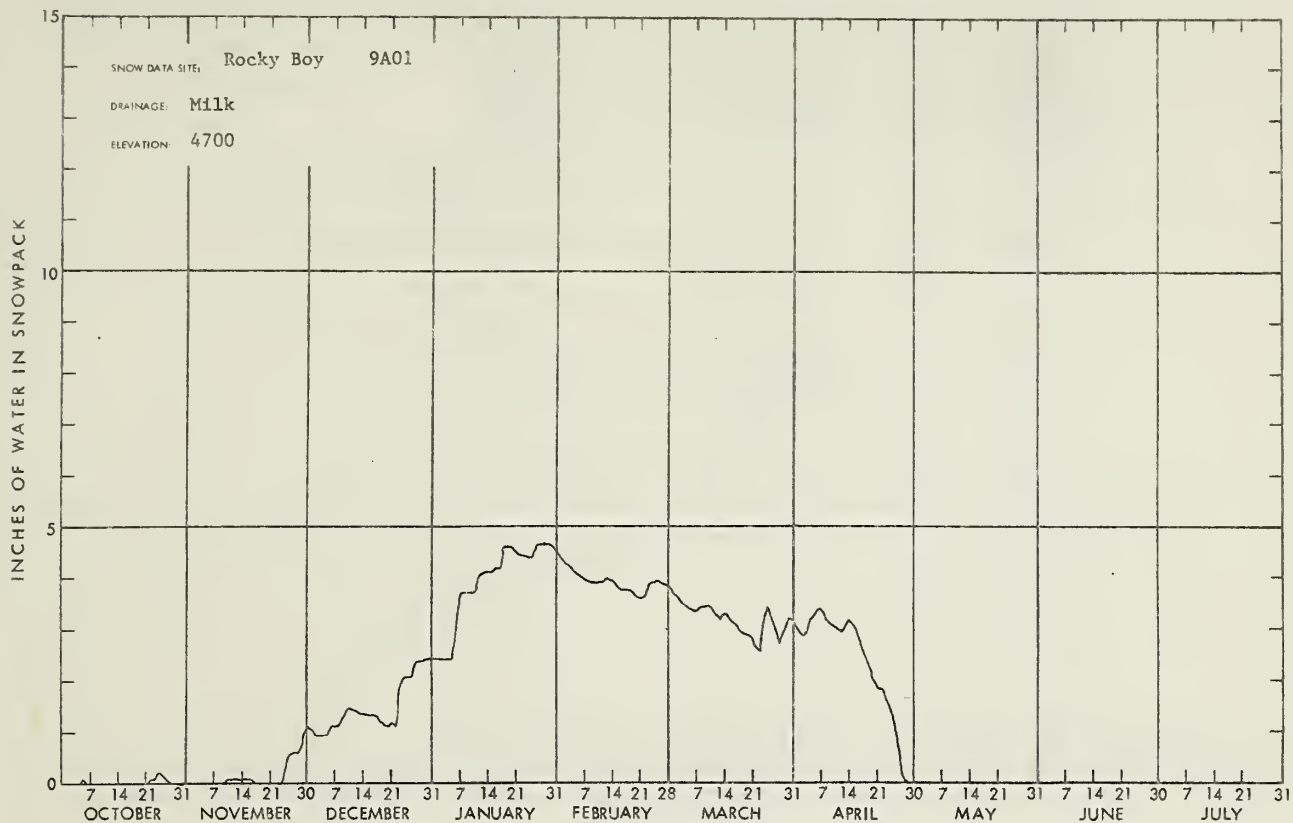


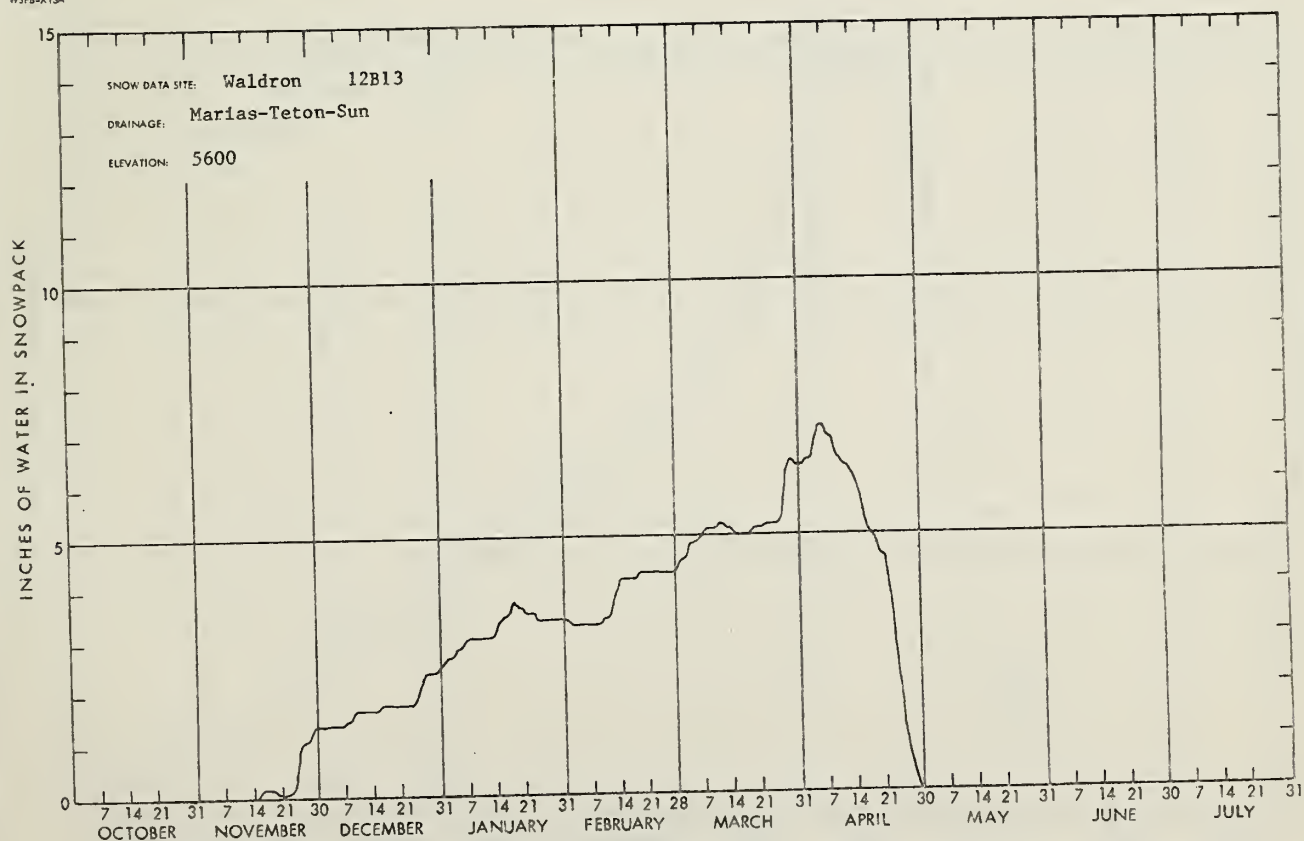
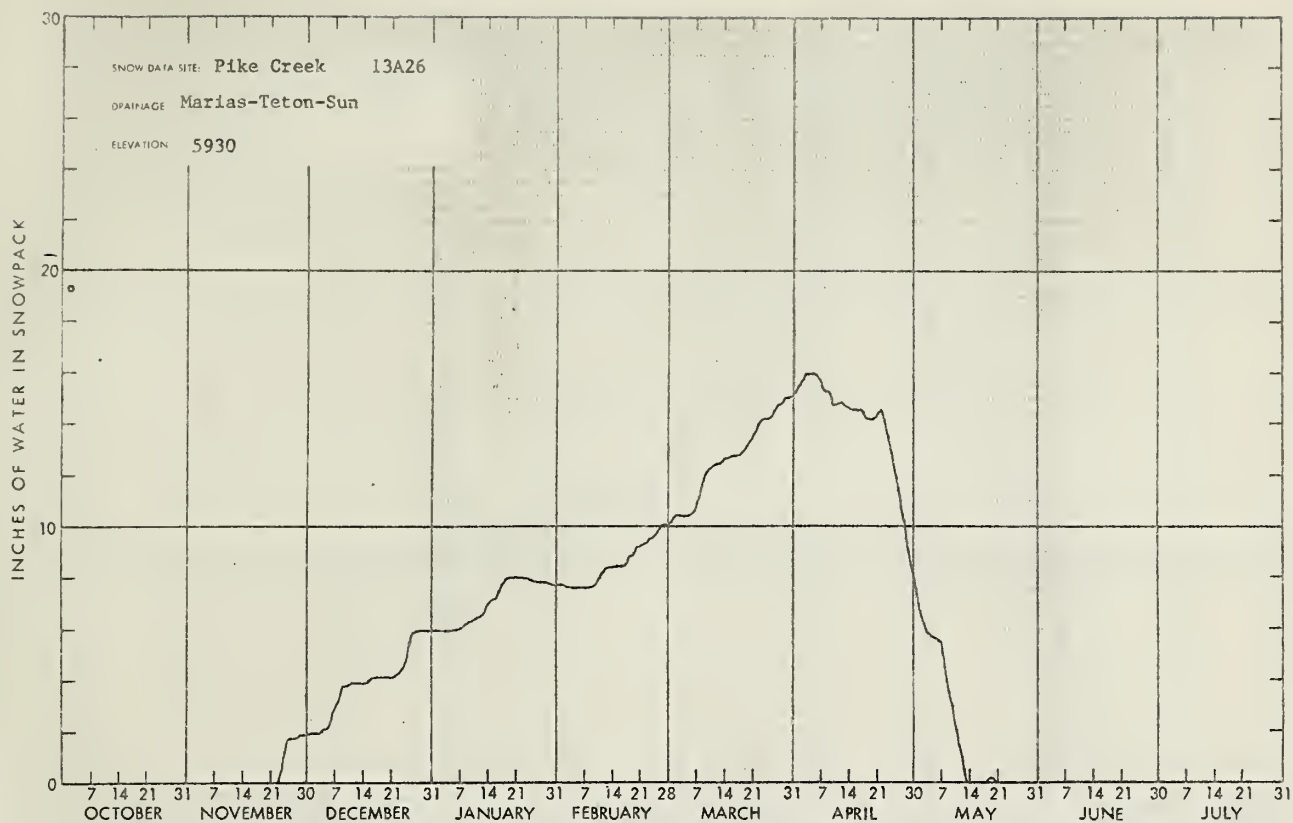


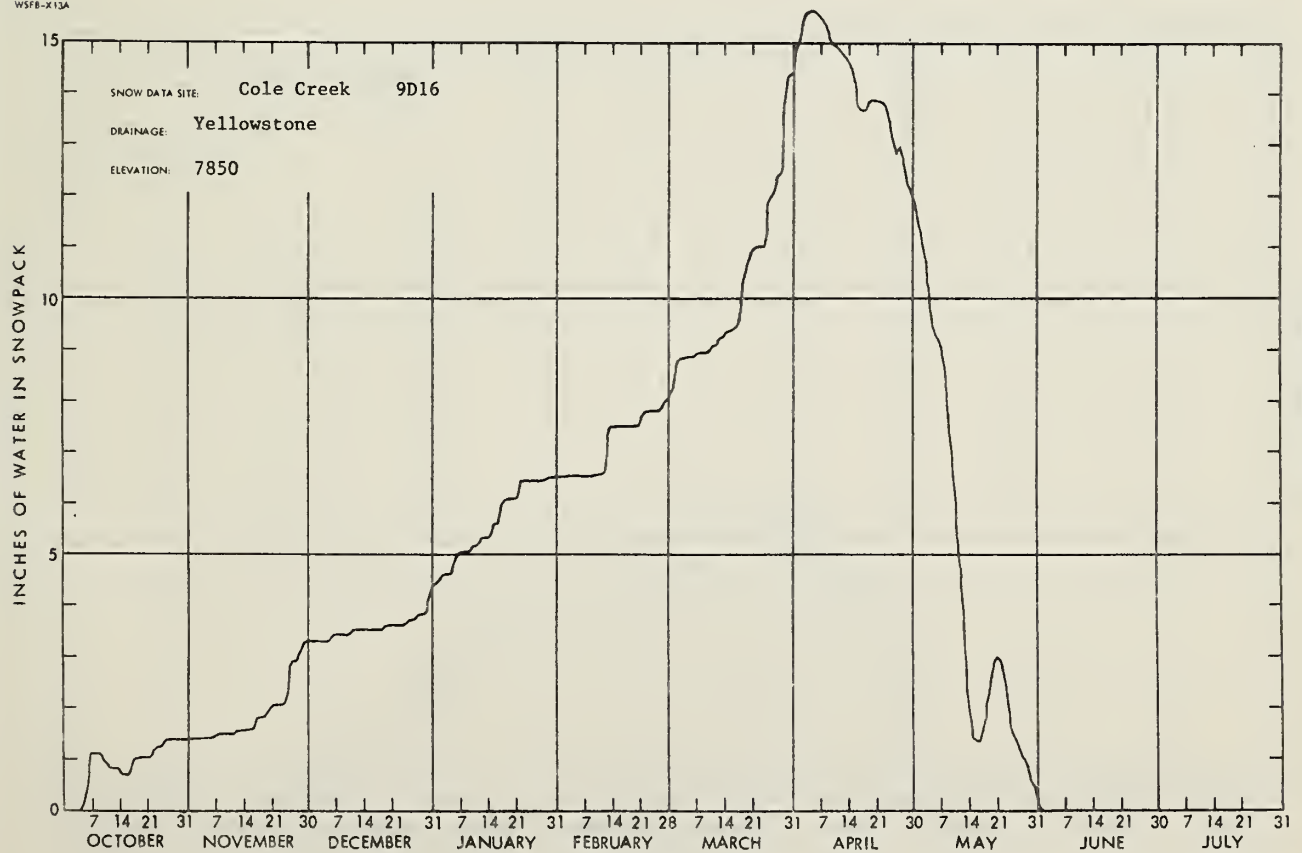
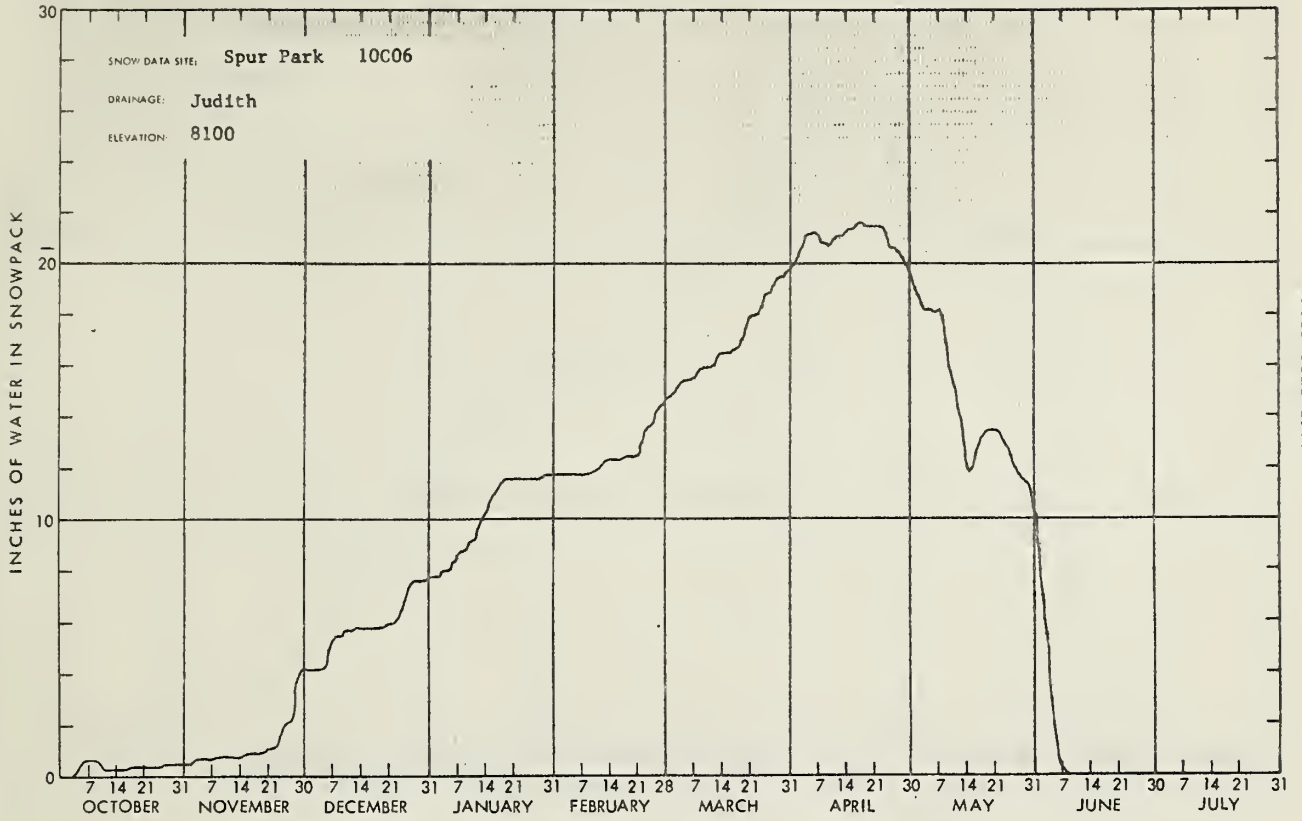
SNOW PILEUP DATA
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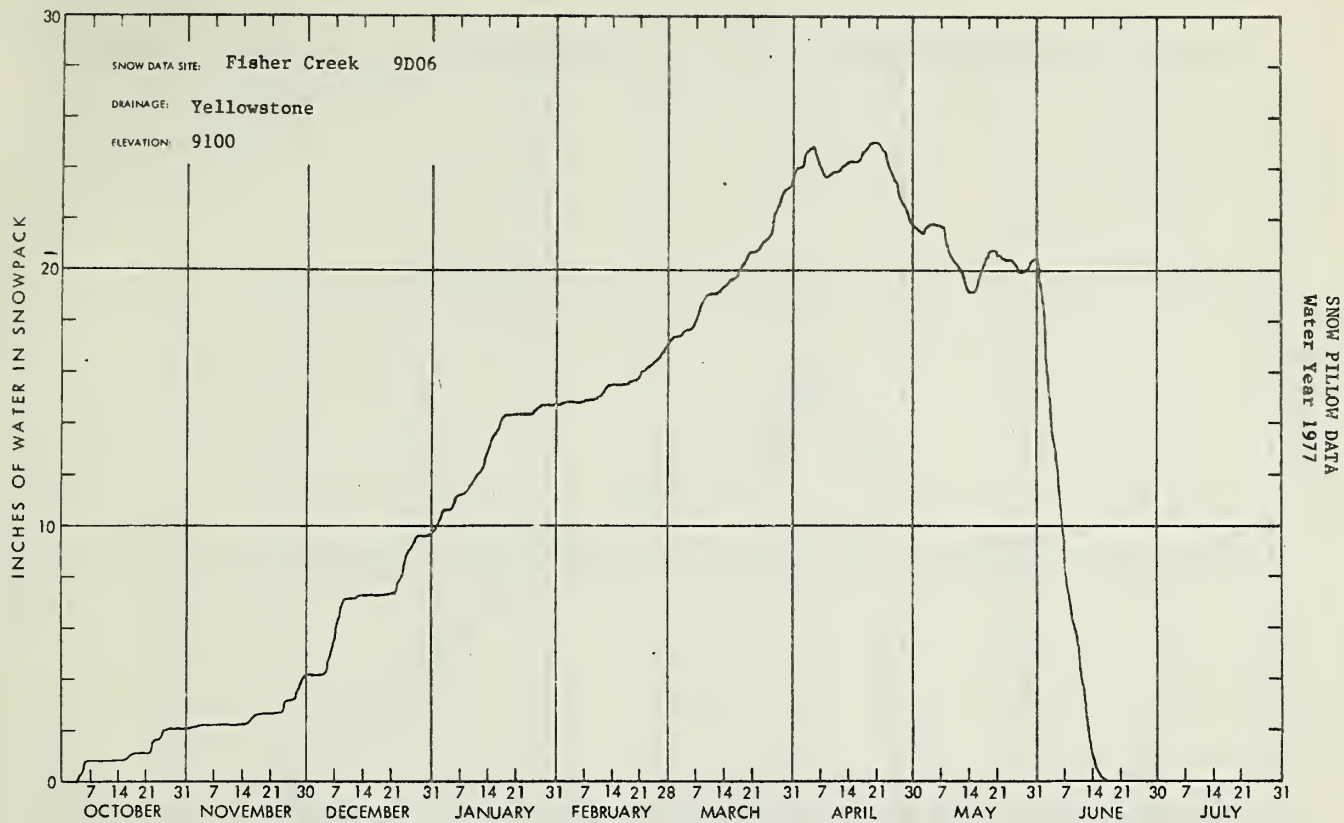


SNOW PILEUP DATA
Water Year 1977

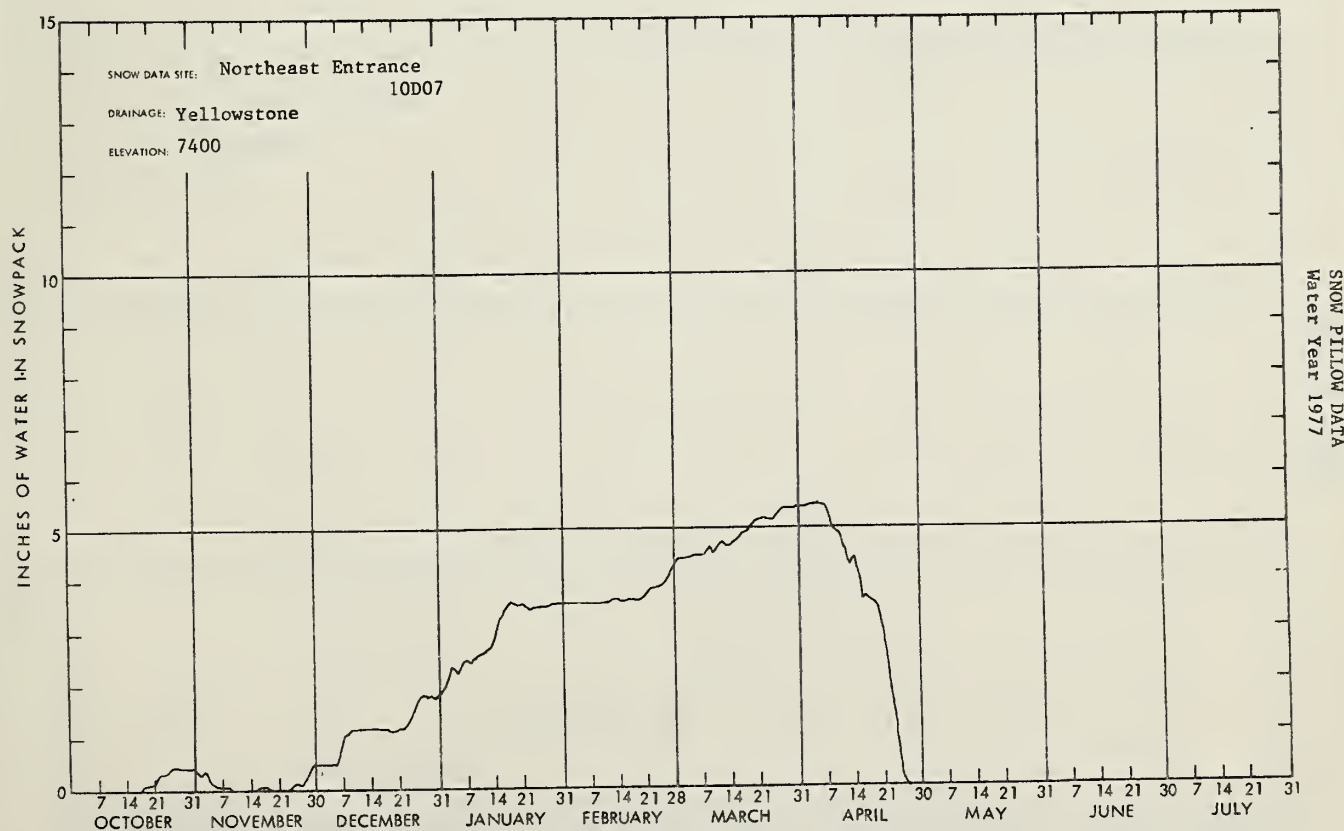


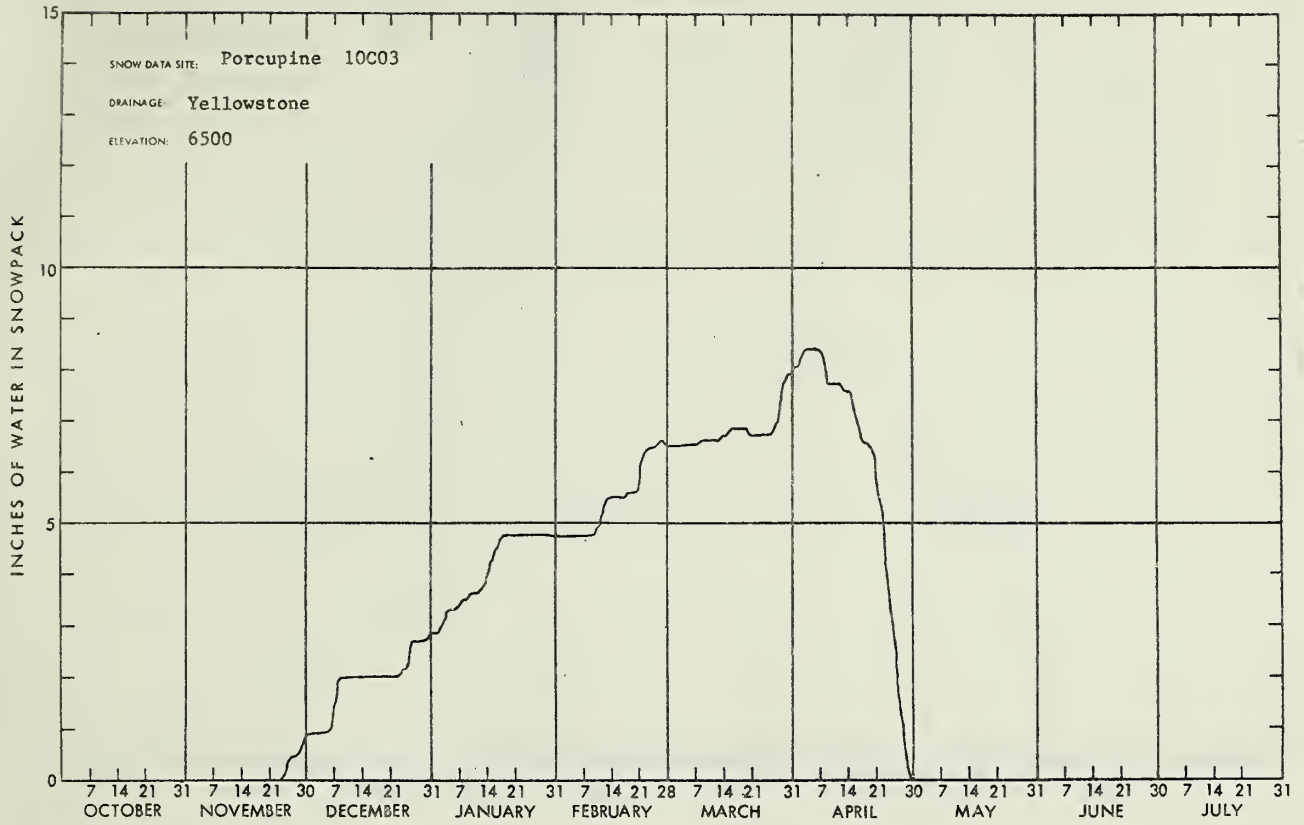
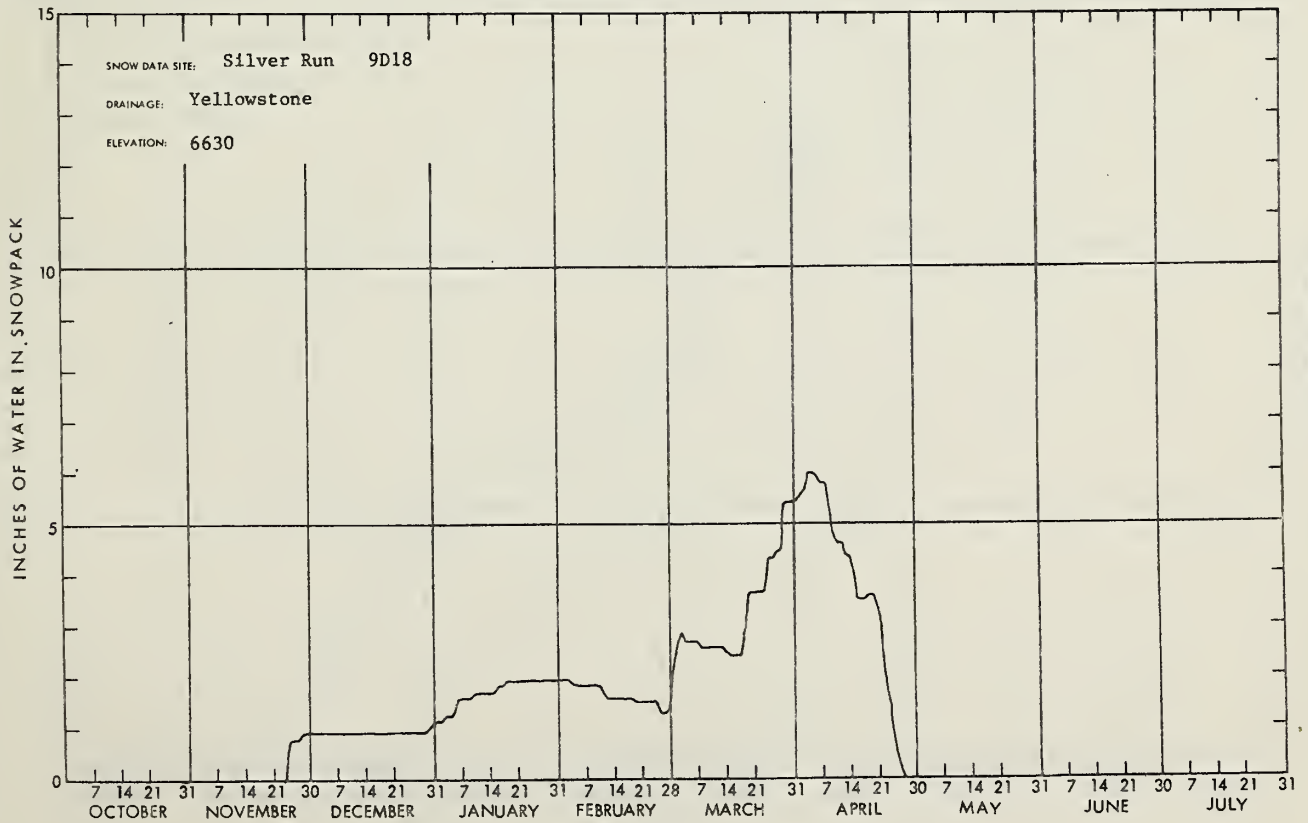


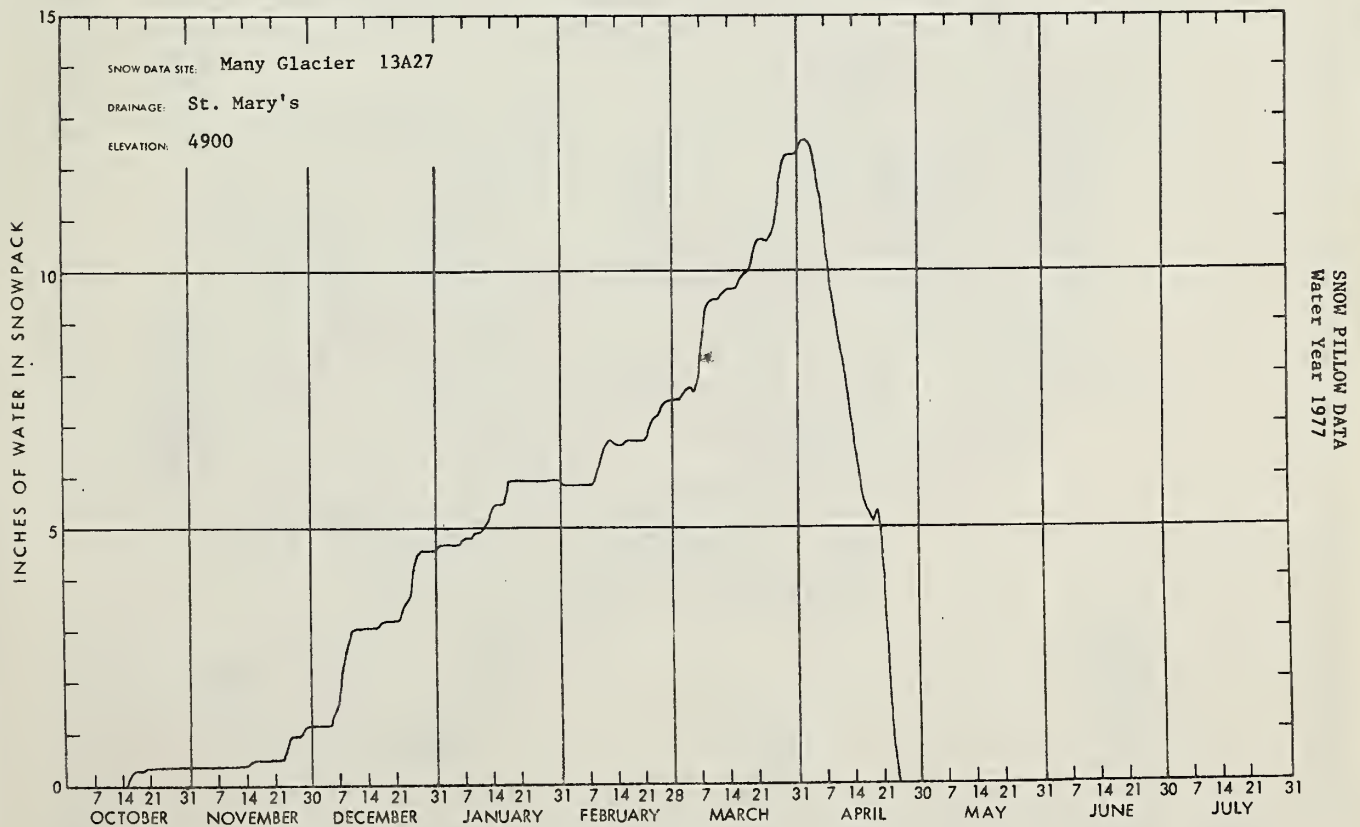
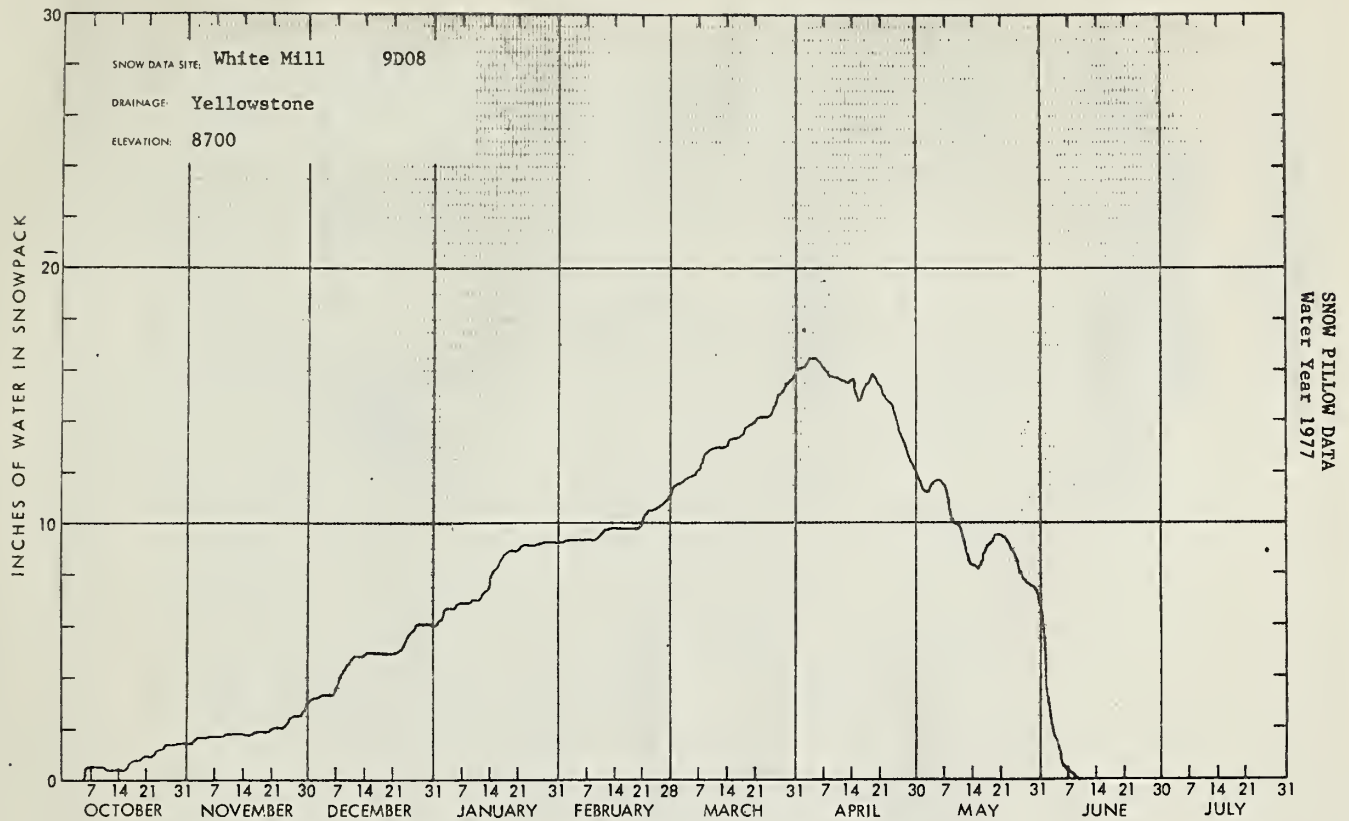


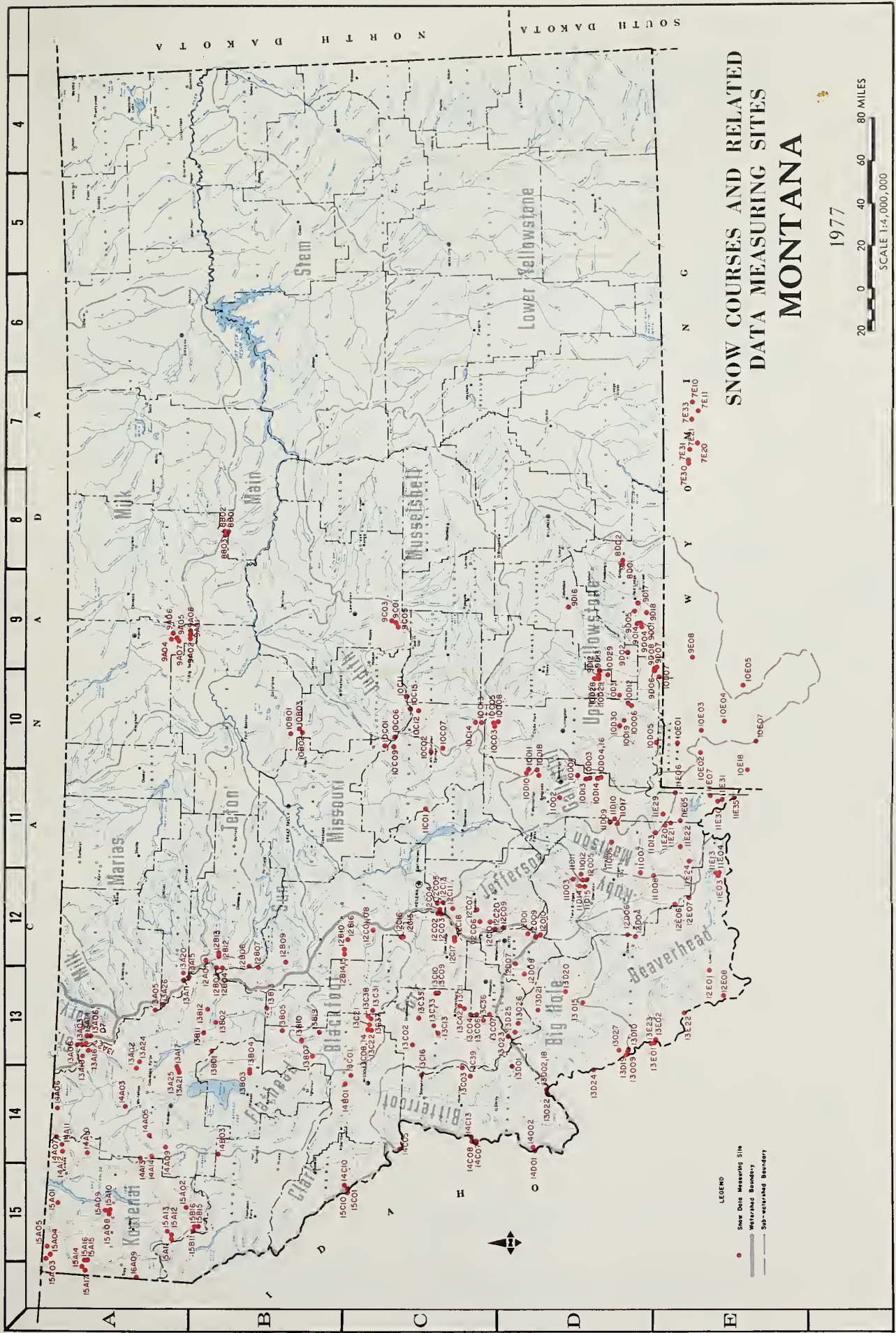


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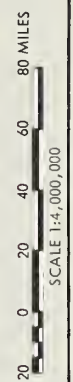
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SNOW COURSES AND RELATED
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MONTANA

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Agencies and Organizations Cooperating in Montana Snow Surveys

GOVERNMENT AGENCIES

Canada:

Water Survey of Canada, Calgary, Department of the
Environment
Water Resources Service, Department of Lands, Forests
and Water Resources, British Columbia
Alberta Environment, Edmonton, Alberta

Federal:

Department of the Army
Corps of Engineers
U.S. Department of Agriculture
Forest Service
Soil Conservation Service
U.S. Department of Commerce
NOAA, National Weather Service
U.S. Department of the Interior
Bonneville Power Administration
Bureau of Indian Affairs
Bureau of Reclamation
Fish and Wildlife Service
Geological Survey
National Park Service

STATE

Montana Association of Conservation Districts
Montana Department of Fish and Game
Montana Department of Natural Resources and
Conservation
Montana State University - Agricultural Experiment
Station
University of Montana - School of Forestry

PRIVATE

Montana Power Company
Butte Water Company
The Anaconda Company

Other organizations and individuals furnish valuable
information for snow survey reports. Their cooperation
is gratefully acknowledged.

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